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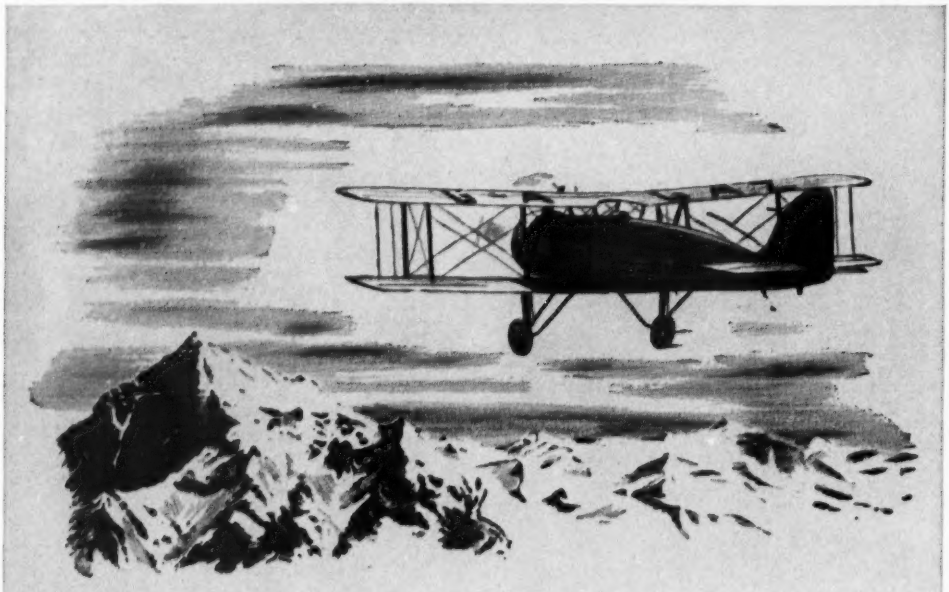

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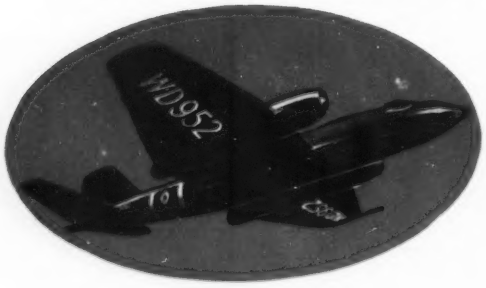

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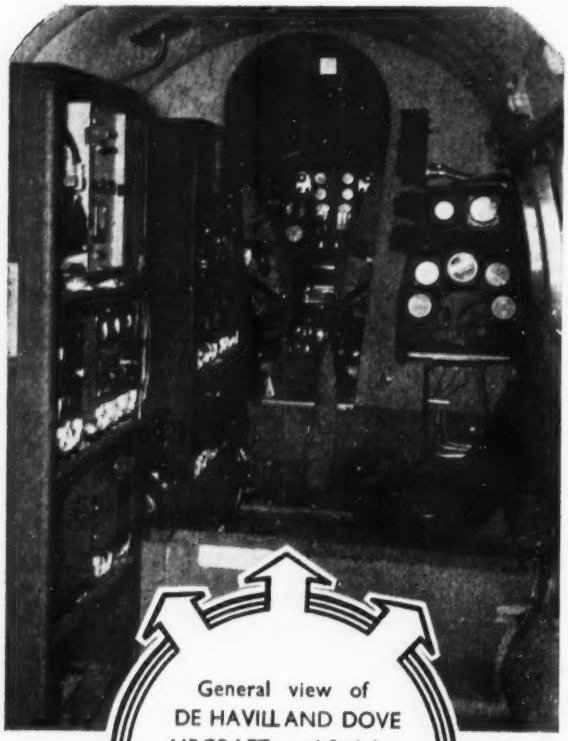

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CHANGES IN STARTER BATTERY MARKET

THE 34th annual general meeting of Oldham & Son Limited was held on August 27th at Denton, Manchester, Mr. John Oldham, O.B.E., J.P., presiding.

In his statement circulated with the accounts the chairman reported a net profit for the year of £262,541. After provision for taxation there was a balance of £109,247. A final dividend of 10 per cent. on the Ordinary Shares was proposed, which together with the interim dividend paid made a total distribution on the Ordinary Shares of 17½ per cent. During the year the Ordinary Share Capital was doubled by a share issue of £200,000 from reserves. Thus the amount of the dividend (last year expressed as 35 per cent.) is unchanged.

BACKWASH OF KOREAN WAR

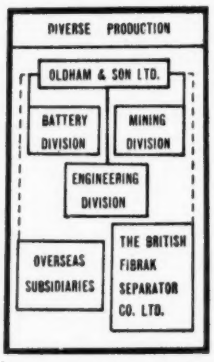
In the course of his speech Mr. Oldham said :—*During the financial year just ended it can be said that trading conditions affecting the car replacement and battery market reflect the backwash of the Korean War.* The twelve months which followed the outbreak of hostilities witnessed a considerable increase in the price of lead, this was followed by increased demands both at home and overseas as stocks were built up during this period through apprehension of shortages arising out of the Korean conflict.

In the period to which I now refer the reverse side of this minor boom has been experienced, for lead has reverted to a lower price level, dropping considerably during the period covered by this report, whilst on the overseas side demands were further affected by currency restrictions, which together with the conditions already referred to were reflected in a reduction by volume in British automobile battery exports of more than one-third.

With trade stocks of batteries now at lower and more stable levels together with more normal trading conditions, increased demands can, in my view, be expected during the financial year.

On the battery side increased quantities of batteries are being called for, as road transport is increasingly employed.

All Oldham automobile and passenger transport batteries have been changed over to employ the new Fibrak form of insulation. Plans to extend the sale and manufacture of Fibrak battery separators throughout the world are proceeding and as part of this programme at home a subsidiary company operating under the title of The British Fibrak Separator Company Limited has been formed. Arrangements are proceeding to manufacture Fibrak battery separators in France. Fibrak has been introduced to the Australian battery industry and considerable quantities have already been shipped.



The year's results underline the value of the Company's policy of diversifying its production and developing overseas manufacture.

We must remember also the increasing contribution which is being made by storage batteries, of the type manufactured by your Company, to a great variety of other activities of this modern world. Oldham equipment is applied to a host of purposes, from lighting the marker buoys of fishermen's nets to providing illumination for the miner underground; from power-driven shop trucks to the automatic operation of switch and relay gear, unattended and often in isolation.

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Teddington

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Standard Settings	29,000, 32,000, 38,000, 42,000 feet.	Weight:	7 ozs.
Accuracy:	±250 feet.	Connections:	Electrical, Plessey Mk. 4 6-pin plug. Pressure ⅛" B.S.P./ A.G.S. union or ¼" diameter pipe connection.
Temperature:	— 40°C to + 70°C.	Control Circuit rating:	5 amps 24 v D.C. Change over contacts.
Vibration:	R.A.E. Technical memo. No. DES. 1. (Central region).		

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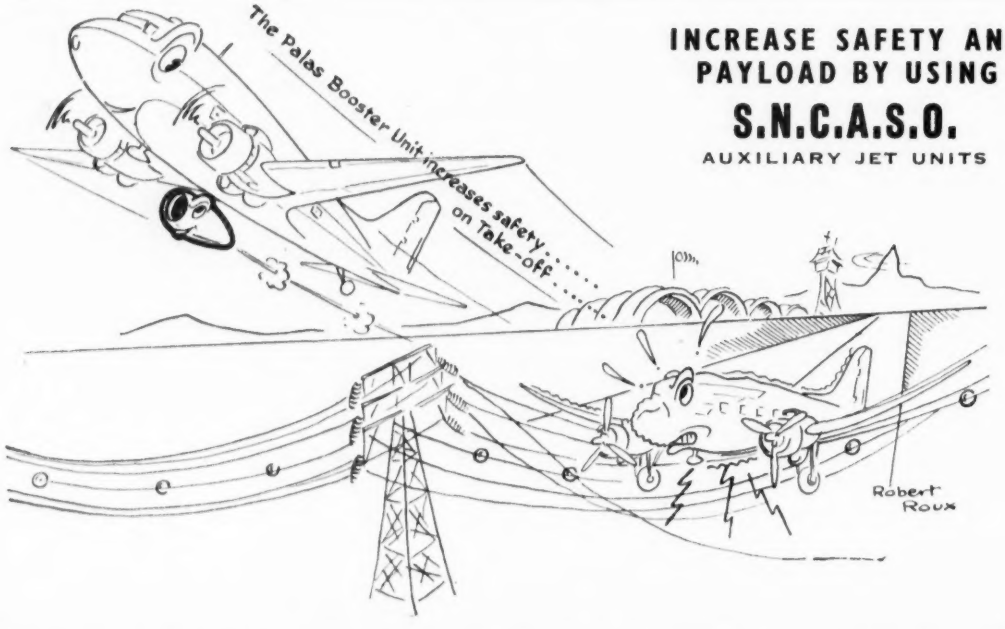

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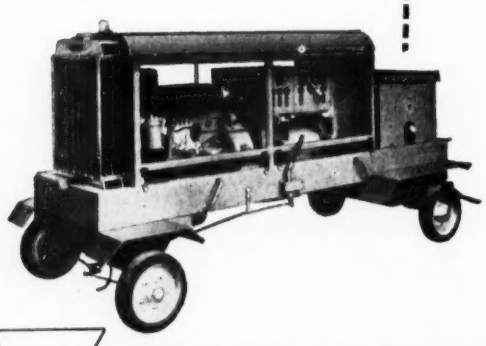

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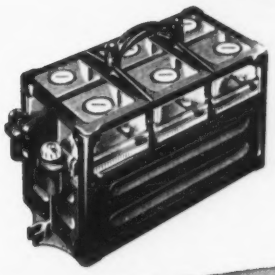

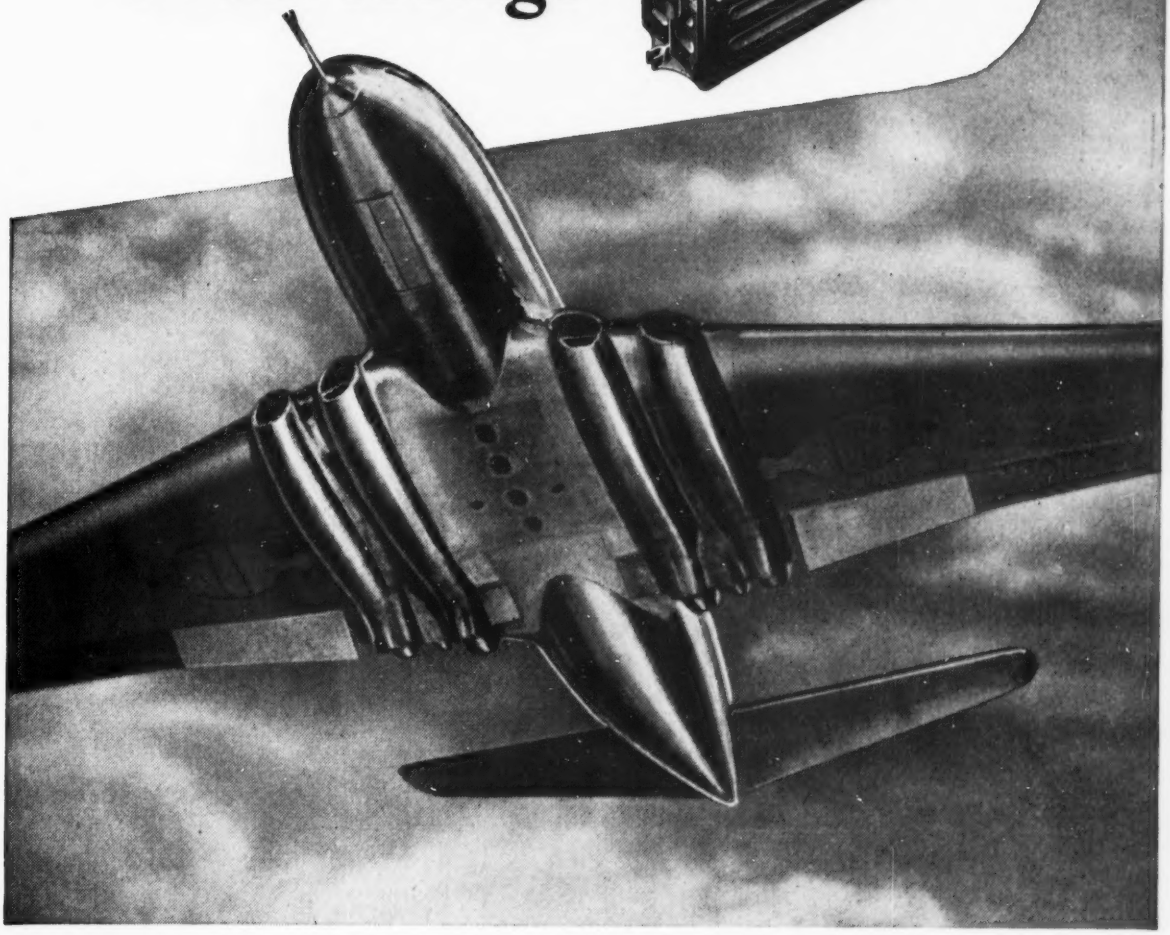

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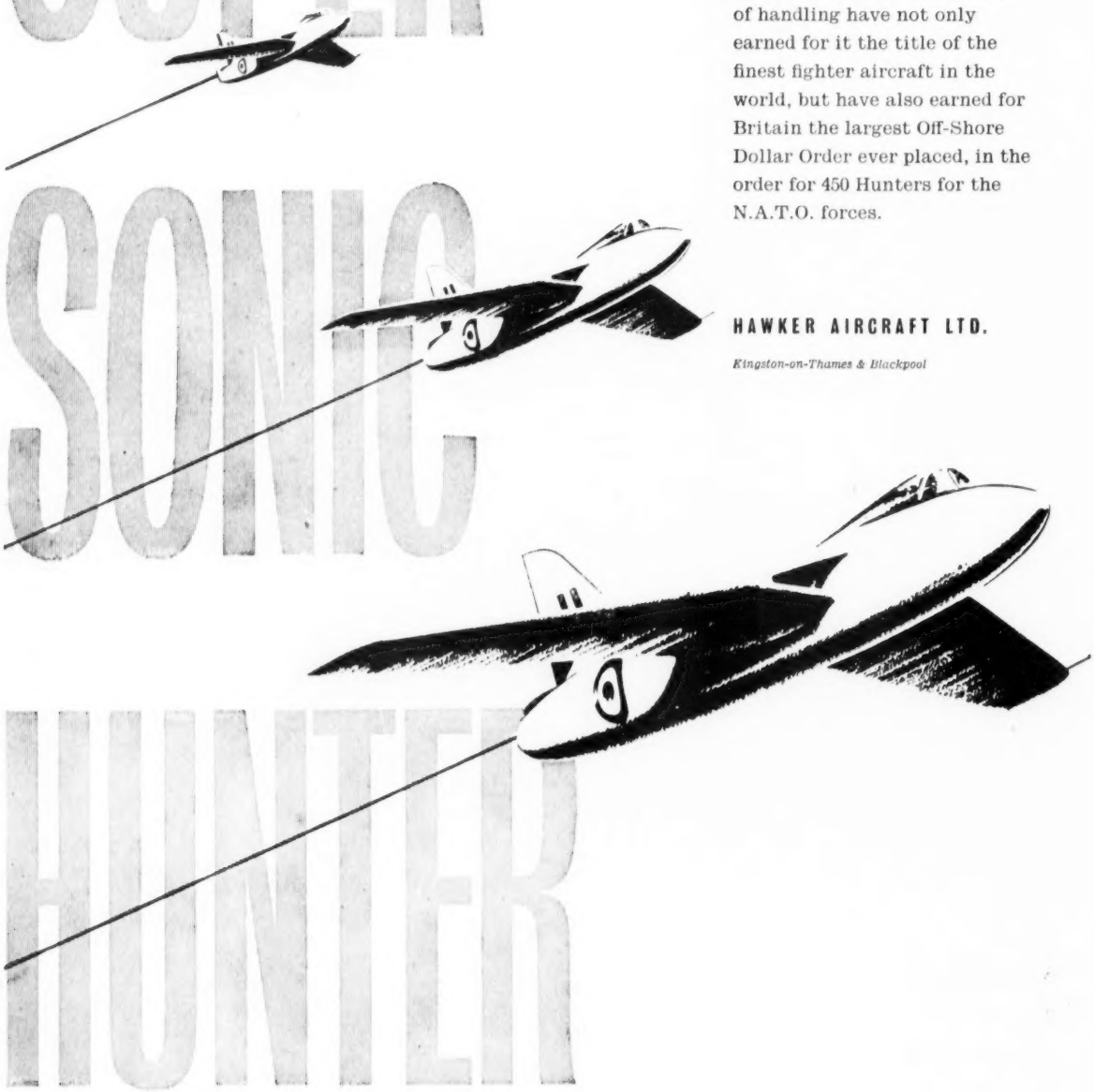

Judged on its performance in the air or in dollar markets, the Hawker Hunter is the outstanding interceptor of the time. Its speed, manœuvrability, range, rate of climb and ease of handling have not only earned for it the title of the finest fighter aircraft in the world, but have also earned for Britain the largest Off-Shore Dollar Order ever placed, in the order for 450 Hunters for the N.A.T.O. forces.

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Victims of Progress

WHAT is the future of the ten B.O.A.C. Hermes IVs now on the market, and soon to be joined by the nine still in service? That a great deal of public capital is still tied up in these aircraft makes their disposal a matter of considerable concern. Whatever the outcome, it will be generally agreed that they must not be allowed to lie unsold at London Airport.

Each Hermes cost B.O.A.C. some £275,000, and this amount was, we understand, to be written off over the usual period of seven years. Their working life with B.O.A.C. has been about three years, so the present book value is in the region of £180,000 per aircraft. About six months ago the Corporation's deputy chairman was quoted as saying that the Hermes would be offered for £198,000—a representative price intended to cover the taxpayer's investment. In Britain, however, the number of independent operators prepared to pay such a sum could be counted on the fingers of a clenched hand.

Broadly speaking, the traffic potential of the present independent network is insufficient to sustain the sudden addition of a large Hermes fleet. As Sir Miles Thomas has suggested, the Hermes would be suitable equipment for an aircraft pool used primarily for trooping and available for immediate use in time of war. But trooping contracts are quickly snapped up, and most of the short-term Army and R.A.F. "tasks" are already being carried out with less expensive but adequate types such as the York or Viking. If more than lip-service is to be paid to the demand for an air-transport reserve, serious consideration must be given to means of increasing the present scale of air-trooping work. This would be in keeping with War Office policy based on practical and economic considerations. We do not intend to suggest the creation of an artificial pool; but if a pool existed it could result in a ready demand for aircraft such as the Hermes.

Many people may find it puzzling that the independents, who have more than once bemoaned the comparative obsolence of their equipment (which affects economy but not safety) have not bid for these Hermes—particularly as B.O.A.C. are almost certainly prepared to accept something like half the figure originally quoted. One important reason is that newer and far more economic aircraft such as the Britannia will become available within the next two or three years, thus permitting systematic planning for a period of seven to ten years ahead. Even comparatively cheap second-hand types would have to be intensively operated to show profitable results during the interim period.

Alternatively, the Hermes may be sold abroad. Potential overseas buyers facing an urgent re-equipment problem will undoubtedly consider two important advantages of the aircraft: they are available for almost immediate delivery as a going concern; and they are probably the least expensive modern aircraft of such capacity to be found on the market today. Of attractive appearance and exceptionally comfortable from the passenger viewpoint, the Hermes should be well worth the consideration of several busy operators now using obsolete machines and seeking an interim replacement. Such companies, by using the aircraft intensively for, say, three to four years, could immediately enhance the appeal of their services to their increasing travelling public, thus paving the way for the newer and much more economic types to come.

To criticize B.O.A.C.'s decision to sell the aircraft would, in our view, be unreasonable. It is the Corporation's responsibility to operate highly competitive services with the most suitable aircraft available. To do otherwise would place an unnecessary strain on the taxpayer, and would be against the interests of British prestige. For want of suitable routes and services in the Corporation's network, their Hermes have become progressively less active as Comets came into service and other machines were down-graded to tourist work. Thus it is necessary to dispose of the Hermes; and we reiterate the hope that the disposal will be achieved speedily. The sad demise of the Solents, most of which have been left inactive and wasting for nearly three years, must be avoided at any cost.

As consolation, the fact that a still-modern aircraft should be retired from B.O.A.C. service at this early stage may be taken as an indication of the progress and exceptional quality offered by the new British airliners now entering service or shortly to do so.

FROM ALL QUARTERS

Britain's Missiles

LAST Saturday, with air-defence exercise "Momentum" entering its closing phase, and with his own departure for the Far East and Woomera at hand, the Minister of Supply, Mr. Duncan Sandys, gave out a statement entitled *Progress of British Guided Rockets*. As an exposition of basic considerations and problems for the edification of the layman it was quite admirable, and it hit the headlines with the unerring force of a homing missile. But—not unexpectedly in this still-early phase of missile development—it told precious little that was new. For this reason too sanguine an interpretation may have been put upon it in some quarters.

Certainly the A.O.C.-in-C. Fighter Command appears to have no illusions concerning the integration of guided missiles within the present defence structure. This, he remarked at a Press conference after "Momentum," would be no easy matter, since the missiles would only gradually take over some of the tasks of fighters and guns; so, the fighter would play a prominent part in air defence for "quite a long time." An efficient warning and control system, he added, was vital to air defence, whether fighters or guided missiles were used; and such a system had undergone a severe test during "Momentum."

Before leaving London Airport last Sunday Mr. Sandys himself said that it was quite incorrect to suggest that when guided rockets were in due course introduced into the Service they would make fighter aircraft obsolete. "As I explained," he said, "some types of guided rockets now being developed will be launched from aircraft. These will greatly increase the effectiveness of our fighters, which will, in consequence, become a more important, and not a less important, element in our defences."

Mr. Sandys' formal statement on Saturday opened with the information that one of the matters which he would be discussing with the Australian Government on his present trip was the progress in our joint efforts on the development of guided rockets. The development of these weapons was initially carried out in Britain by the Ministry of Supply or by outside firms. After a weapon had undergone preliminary firing tests here it was sent to Australia, where full-scale trials with explosive warheads could be carried out at Woomera. If modifications were needed they could for the most part be made in the workshops set up in the vicinity of the range by the Australian Government, and by the Australian branches of the principal rocket firms in Britain.

During the past year our scientists and technicians had made further remarkable advances in the development of guided rockets to meet the requirements of the three fighting Services. Their work had centred upon speed and guidance. In order to tackle bombers flying as fast or faster than sound, and at heights above 50,000ft, the rockets had to travel at more than 2,000 m.p.h.

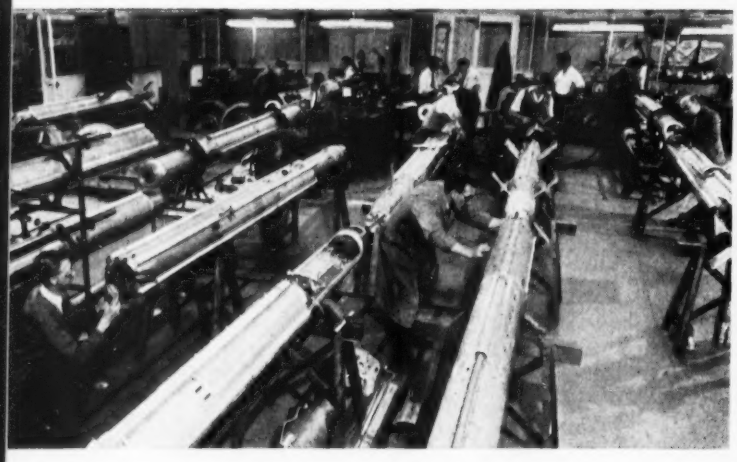
If the missile was to intercept and destroy a raider before it could release its bombs, no time must be lost in building up its velocity. Mr. Sandys having in this connection made reference to the use of booster rockets, went on to speak of the necessity for the missile to change course rapidly should the bomber take evasive action. No piloted aircraft, he said with confidence, could hope to out-manœuvre guided rockets of the type we were now developing; but since the stresses in the missile increased with every extra pound carried, continuous efforts were being made to reduce weight through the use of lighter materials. New methods had been evolved for moulding large plastic structures and before long it might be possible to make the whole of the rocket casing out of these materials. This would reduce weight and cost. The statement concluded:—

"Some types of rocket are known as 'beam-riders.' They fly up a radar beam which follows the target automatically and is operated from the ground. Even at long ranges these rockets can keep themselves within a few feet of the centre of the beam. Then there are so-called 'homing rockets.' As soon as they have been launched these missiles take over control completely. They lock their guidance mechanism on to the enemy plane and, without any further assistance from the ground, they steer towards it, changing course as necessary. Unlike ground-controlled 'beam-riders' their accuracy is unaffected by distance.

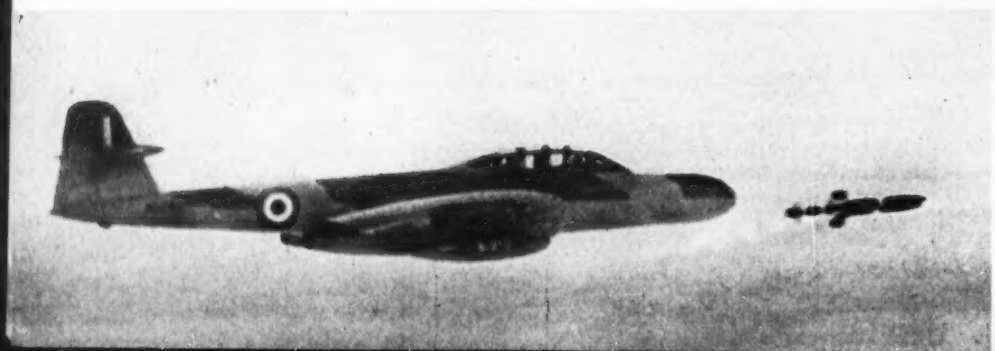
"In addition to missiles fired from the ground or from ships, we have reached an advanced stage in the development of guided rockets to be launched from fighter aircraft. These will increase the killing power of our fighters many times over, and will enable them to engage an enemy bomber from a distance beyond the range at which it can defend itself with any conventional aircraft gun.

"Initially our efforts were concentrated on the problem of defence against enemy air attack. For this purpose a series of missiles has been evolved—some to be launched from the ground, some from ships, and some from fighter planes. While these anti-aircraft weapons will be the first guided rockets to be brought into service, they will be followed by other types for use in various artillery and bombardment roles."

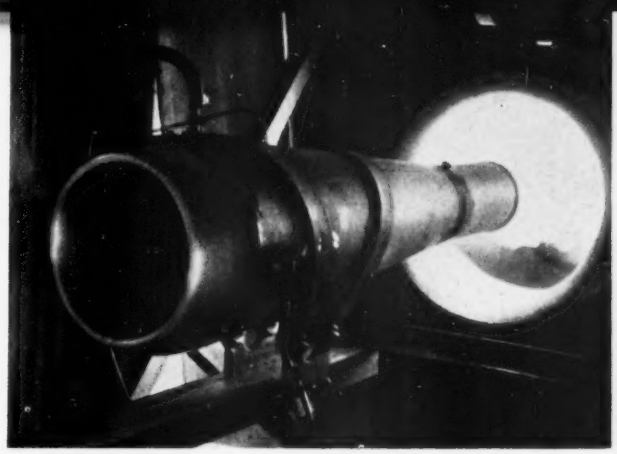
ASSEMBLY SHOP for rocket-propelled missiles at a Ministry of Supply establishment (below).



GROUND-TO-AIR missile, as referred to in the Minister of Supply's statement paraphrased above, gets going at some 2,000 m.p.h., having discarded its booster rockets.



AIR-TO-AIR missile launched from a Meteor night fighter during recent tests in the United Kingdom (left).



NEW DEPARTURE for Saunders-Roe is the development of pulsejets, as described in the accompanying paragraph. Seen running (left) is the 120-lb unit; right is the 45-lb type, to be shown at Farnborough.

Saunders-Roe Pulsejets

IN London on August 25th Saunders-Roe, Ltd., exhibited for the first time a 45lb-thrust pulsejet developed by their Helicopter Division. On the same occasion it was announced that a 120lb-thrust unit is already running at Eastleigh Airport Southampton. The company state that, having considered various forms of propulsive units for helicopters, they decided that the pulsejet was the most promising. It could also be used as a take-off unit for sailplanes and for guided missiles.

The 45-lb unit operates at a frequency of 120 c.p.s., but this may be varied, according to chamber design, to a figure of over 200 c.p.s. or as low as 46 c.p.s., as on the German V.1. Other data for the 45-lb unit are length, 47.5 in; max. diameter, 5.5in; weight, 15.5 lb.

Sir Archibald Rowlands

WHEN, but eight months ago, we announced the retirement of Sir Archibald Rowlands, G.C.B., M.B.E., from the post of Permanent Secretary to the Ministry of Supply, we little thought it would so soon be our melancholy duty to record his death: Only 60 years of age, he passed away suddenly, as a result of cerebral hæmorrhage, at his Henley-on-Thames home on Tuesday of last week, August 18th.

Sir Archibald Rowlands.

That for this short period he had less direct contact with the aircraft industry will in no way lessen the sense of loss that his death causes, for he had made, and maintained, very many warm friendships.

He had been a Permanent Civil Servant from the age of 28; previously to that he had served with distinction in the 1914-18 war as a captain in the Army Cyclist Corps, being awarded the Military M.B.E. In the inter-war years he held a succession of increasingly responsible posts in the War Office, and in 1936 he was made Adviser on Military Finance to the Indian Government.

He returned in 1939 to become Deputy Under-Secretary of State in the Air Ministry, and it was in 1940 that he assumed the duties for which by many old friends he will be best remembered—as Permanent Secretary to the Ministry of Aircraft Production, under the Beaverbrook *régime*. Of those remarkable days it is recorded that he would return to his office at 9 p.m. and work until 3 a.m., then be at his desk again by 9 a.m.—and this day after day.

From the end of 1943 until 1947 he was temporarily lost to aviation, being employed in various senior posts concerned with administration in India; when he returned, it was as Permanent Secretary of his old Ministry, now the Ministry of Supply.

It was largely through Sir Archibald's unique ability to combine tenacity of purpose, sound judgment and a warm friendly personal approach that relations between the Ministry and the aircraft industry were of the happiest kind. He was a man of decision and unlimited capacity for hard work, yet his manner was seldom austere; he was, in the modern idiom, "good value at a party." And, as we said in *Flight* at the time of his retirement, quoting the words of one of his colleagues, "He never hid himself behind red-tape defences, believing always in informal personal contacts; and he was a man of the highest integrity, whose promises could always be relied upon for fulfilment."

R.Ae.S. Medals and Awards

ON September 14th, when the Wilbur Wright Memorial Lecture is read at the Royal Institution (by Prof. N. J. Hoff, F.R.Ae.S., I.Ae.S., whose subject will be "Structures"), the R.Ae.S. medals and prizes will be awarded, as is the custom on this occasion. Names of recipients are announced by the Society as follows:—

The Society's Gold Medal (the highest honour which the Society can confer for work of an outstanding nature in aeronautics).—E. F. Relf, for his outstanding contribution to aeronautical science over a period of many years.

The Society's Silver Medal (for work of an outstanding nature in aeronautics).—H. Grinsted, for his outstanding work in aeronautical engineering.

The Society's Bronze Medal (for work leading to an advance in aeronautics).—L. Boddington, for his work on the development of Naval aircraft.

British Gold Medal for Aeronautics (for outstanding practical achievement leading to advancement in aeronautics).—R. E. Bishop, for his outstanding contribution to aircraft design.

British Silver Medal for Aeronautics (for practical achievement leading to advancement in aeronautics).—J. E. Gordon, for his excellent work in the sphere of aircraft structural plastics.

Wakefield Gold Medal (awarded to the designer or inventor of any apparatus tending towards safety in flying).—F. W. Meredith, for his work in the design of automatic pilots and aircraft instruments.

Simms Gold Medal (for the most valuable R.Ae.S. paper on any subject allied to aeronautics).—Major P. L. Teed, for his paper on "Fatigue of Aircraft Materials with Special Reference to Micro-Structure."

George Taylor (of Australia) Gold Medal (for the most valuable R.Ae.S. paper on aircraft design, manufacture or operation).—G/C. E. A. Whitely, for his paper on "The Spacing of Aircraft under High-Density Approach Conditions."

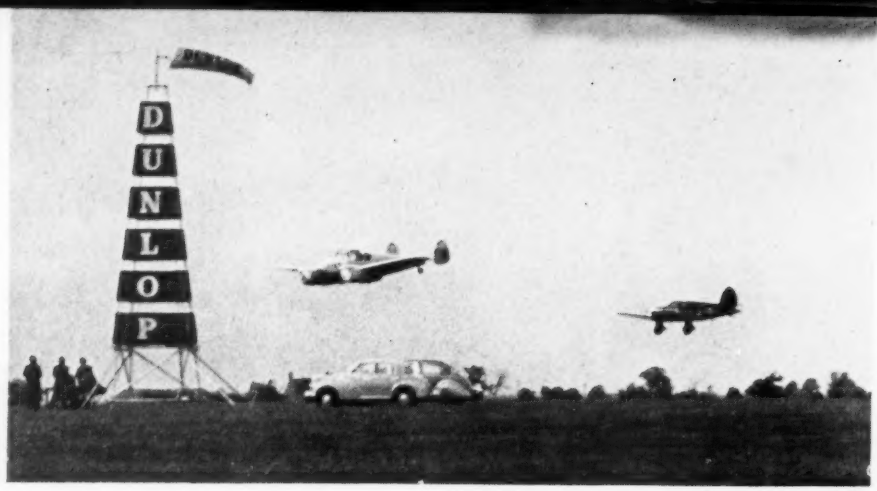
A number of other awards have also been made, and will be presented on some other suitable occasion to be decided by the R.Ae.S.

Low-cost Airfield Radar

AT Blackbushe Airport last Monday, Decca Radar, Ltd., demonstrated a new airfield radar known as the Type 424. The equipment is capable of fulfilling the functions of airfield surveillance, G.C.A. and local approach control. It appears to be equally suited for both civil and military applications and is both simple and compact. For a relatively low cost—£5,000—it can provide the small civil airport with G.C.A. facilities adequate for any traffic that could be expected, and the military airfield with a practical landing aid which would accommodate a high density of fighter landings. The designers of the Type 424, in fact, have sought to produce a cheap, simple radar approach-aid which nevertheless achieves results comparable with those of larger and vastly more costly and complex counterparts. A detailed description of the equipment and of its capabilities will appear in a future issue.

C. L. W. Trusk

WE regret to have to record the death of Mr. C. L. W. Trusk, A.F.C., on August 18th, in hospital at Aylesbury, after a brief illness. Claude Trusk, who was 54 years of age, had been chief test pilot to Airwork, Ltd., since 1944. His connection with the company dated from early 1938; previous to that he had served with the R.A.F. in 1918-19 and again from 1924 to 1937. His successive posts thereafter included: navigation (flying) instructor, Shoreham and Cheltenham, 1938-39; manager and chief navigation (flying and ground) instructor and test pilot, No. 6 A.O.N.S., Staverton, 1940-41; manager, No. 21 E.F.T.S., Booker, and No. 1 A.O.S., Wigtown, 1941-42; maintenance manager, No. 6 A.O.N.S., 1942; and manager, No. 21 E.F.T.S., Denham, 1942-45. During the latter part of the last-named appointment he also became chief test pilot.



(Right) A very close finish in Heat 2 between Nat Somers' Gemini and A. S. K. Paine's Proctor. (Below) J. N. Somers, winner, receives the Siddeley Challenge Trophy.

AIR DAY AT COVENTRY

Excellent Racing to finish the Season: Bright and Dull Patches

FOR the Midlands, and for visitors from all around the country, a mammoth programme of displays and racing was arranged by the Aerodrome Committee at Baginton, Coventry, last week-end. Starting around 2.30 p.m.—the Lord Mayor performed the opening ceremony—it was still going on at 7.30 p.m. as the shadows grew long and those who planned to fly home had been looking at their watches for some time past.

There was, indeed, plenty to entertain all, and it was no fault of the committee that crowds were smaller than last year; the selfishness of those who instigated a local bus strike for the afternoon (13,000 travelled by bus to Baginton last year) and the mackintosh weather must have deterred many.

The events which actually took place bore some resemblance to the printed programme, and first-class finishes to the heats and to the final of the Siddeley Trophy Race, coupled with popular successes in the competitions, kept visitors in good spirits.

To deal briefly with items of the display before describing the racing, we would say that the Little Rissington Meteor formation was a credit to C.F.S., the inverted leadership being especially impressive. The first of three surprise items turned out to be a masterly demonstration of a Meteor N.F.12 from the Armstrong Whitworth factory across the airfield. The pilot was Joe Lancaster. Cavorting by a Tiger Moth led up to the heats for the race described later.

Bramcote Seafires—six of—gave their customary rousing display to be followed later in the programme by another, which included rocket take-off. A well-judged parachute descent from a Navy W.S-51 helicopter, which made a prolonged vertical ascent, added variety, and neat Chipmunk aerobatics by F/L. E. C. Hunt from No. 5 R.F.S., Castle Bromwich, were entertaining.

Number two surprise item was slightly nostalgic: S/C. Leo de Vigne brought over the old Lancastrian test-bed with two very throaty Sapphires installed outboard. His fully-feathered climb away bore eloquent testimony to the thrust of these big Armstrong Siddeley axials.

We have often remarked that it is hard to think of any more adjectives of praise for the perennial Patrouille. On this occasion Captain Kerguelen flew the individual machine and Lieutenants Darbois, Menard and Claveau the formation. The wind was gusting to 20 kt, yet the station-keeping was immaculate and, if slightly separated at any time, they came together again as if under magnetic force. Their whole performance, singly and rolling three as one, was masterly. We have never seen them do better.

Chuck Thompson, parachutist, was a performer soon after this, and few people realized his predicament as they watched him swing on a rope ladder hanging from an Auster and finally descend by parachute to add one more drop to his 200 and odd. In fact, he was performing from a substitute aircraft, and while still well below safe dropping height his rip-cord was partly pulled in error as he climbed out of the aircraft and down the rope ladder. Fortunately it did not stream and drag him off.

Surprise item 3 was provided by two energetic Naval pilots who formated and performed quite hectic manœuvres individually with their W.S-51 helicopters. From noon until dusk they frequently popped up to give rides or demonstrations. Sometimes they just started their engines and inconvenienced the commentator. Their display was as good as any we have seen with S-51s and their low Prince of Wales feather towards the crowd (central plume missing, of course) was definitely exciting.

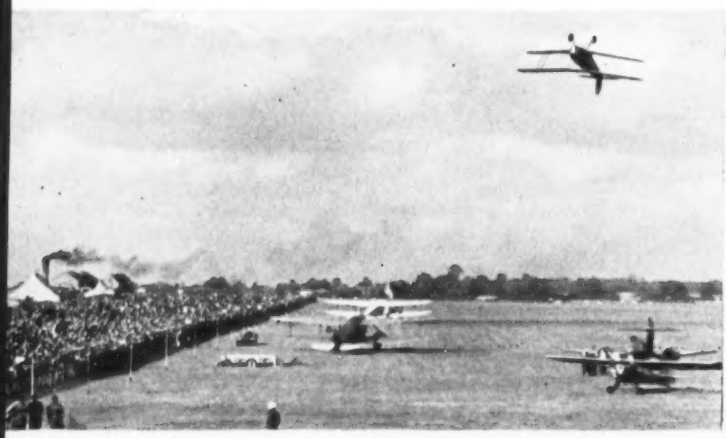
We and many others were compelled (or chose) to take off for home before the pupil-and-instructor act, a gliding demonstration by the quite recently formed Coventry Gliding Club (in, we believe, a Leicester machine), and aerobatics by Prince Cantacuzene, whose morning practice was as thrilling as always. Particularly we were sorry to miss an evening performance by F/L F. J. Lazendy from C.F.S. in a Meteor from C.F.S.

SIDDELEY CHALLENGE TROPHY AIR RACE

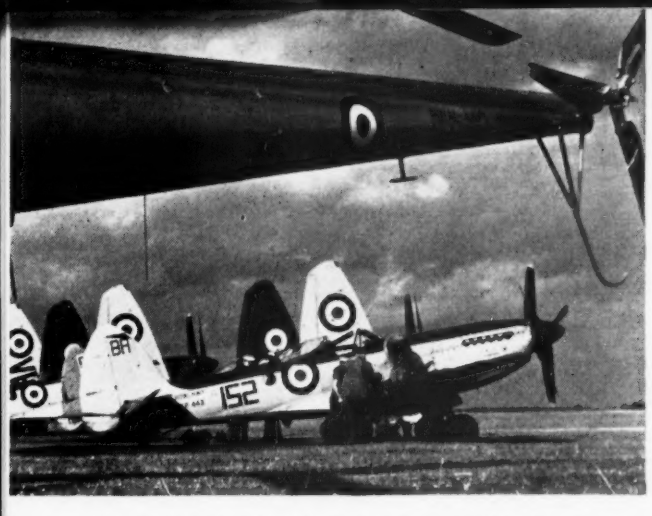
Racing No.	Pilot	Aircraft	Start Times	Speed	Place
24	A. A. Bough ...	Tiger Moth ...	0.00	108.5	4
41	A. W. Bedford	Whitney Straight	4.38	125.0	9
46	A. J. Spiller ...	Leopard Moth	5.45	129.0	10
90	P. Blamire ...	Gemini 1A ...	7.21	139.0	7
77	G. R. J. Parker	Proctor 5 ...	8.13	145.5	3
74	P. Hillwood ...	Proctor 1 ...	8.33	146.0	6
73	A. S. K. Paine	Proctor 1 ...	9.21	153.0	2
98	J. N. Somers ...	Gemini 3 ...	10.18	159.5	1
94	F. Dunkerley	Gemini 1A ...	11.28	165.5	8
95	S/L. J. Rush ...	Falcon Six ...	11.34	167.5	5

The Racing

Ten aircraft took part in the first heat of the Siddeley Trophy race. There was a double interest in the outcome of this final National Air Race of the year because upon its results depended



The Patrouille d'Etampes were excellent, as always. Captain Kerguelen is the inverted performer in very gusty conditions.



The Navy took a major part in the display. Some of their Seafires are seen beneath the tail of one of two W.S-51s. Below, Blamire's Gemini rounds the airfield Dunlop pylon, one of the four turning-points.

the placings for the Air Racing Championship for the year.

The race was flown over four laps of a short rectangular course with legs 1.271, 6.102, 1.335 and 5.829 miles respectively. The total distance was thus 58.148 miles, aircraft being required to round a scatter-point after take-off before joining the course proper. For most of the time the aircraft were in view.

Both Ron Paine and Bowles who were among the favourites anxious to gain points for the Championship were unfortunately eliminated in the heat. They had difficulty in seeing a turning point and slower aircraft in a heavy shower, and went very wide to be sure, but this certainly cost Ron his chance in the final, if not a first in the heat and the championships.

For most of the race it seemed that the long-handicap Tiger would retain its lead and that Hillwood in the Proctor would be well up in front. In fact, as the machines loomed up into wind in an ever-tightening bunch it was impossible to say who would cross the line first. The two Austers flown by Gregory and Loveridge, who had a good private race, seemed well up. But no, it was to be the black Whitney Straight with Bedford at the controls which swept in very low to steal a last-second win, with Hillwood closing fast—but not quite fast enough.

A Coventry-Club Gemini newcomer flown by P. Blamire and apparently quite standard came well into third place, and the other two to qualify for the final were Bough on the Newcastle Tiger and Spiller on the old Leopard.

Several of the old protagonists were together in the second heat, and both Dunkerley and Somers were back in their trusty Geminis again. Fillingham had deserted his Chipmunk for a Hornet Moth, while Rush, Parker, A. S. K. Paine and Jemmett were mounted as always.

Playing a hunch, we put our money (5 to 1 at the time) on Somers, with Rush as a good second; yet, having seen Fillingham's first lap, we wondered about hunches. But Somers' Gipsy-Gemini, now pale-blue in colour and re-standardized with outside venturis, fan-driven generators, and so on, was going very well, too. Rush was able to pick up just that vital few yards each lap on Dunkerley who lost most of his six seconds advance on take-off.

By the third lap it was clear that Somers was going well and flying beautifully, and that Sailor Parker and A. S. K. Paine were "mowing" in their Proctors. But still there was no change in starting position except for Rush being ahead of Dunkerley.

For a second time the approaching dots got slowly closer to the Dunlop pylon and to each other, and by a freak of lighting their colours were clearly visible even before the types could be recognised. It was apparently between blue, red, cream and black.

A real photo-finish resulted, but Somers had just made it, both Rush and Dunkerley had come through most of the field but had to be content with a fourth and fifth, the two Proctors of Paine and Parker having just kept ahead to the line. Fillingham, last year's Champion and lying a good fourth this year, ran out of places and thus was unfortunately out of the racing and the Championship.

The final came later in the evening when the showers had passed and the wind was lighter. Bough in the Tiger had a long start and was, in fact, on his second lap before most of the others were airborne. The three Proctors slowly closed up on the field while the Whitney Straight and Leopard Moth roared on alone—as did Blamire's and Somers' Geminis—the latter being very low. Dunkerley and Rush virtually continued their private race begun in the heats, and with the same result. Again, no other change in starting-place occurred until the end, for the handicappers had really excelled themselves. Within seconds of the end half-crowns were still offered on the Tiger Moth and the Whitney Straight, but at the boundary it seemed certain that the red Proctor must win with Somers second. At the post the order changed, with Somers' Gemini diving extremely fast to grass level to snatch the Trophy from Paine and Parker, who were second and third. The Tiger was fourth and, as an indication of the closeness of the finish, Rush was fifth and Dunkerley eighth, even though they were no more than 200 yards apart throughout the whole race. At the post, only 35 seconds separated the field.

And so Nat Somers took the Siddeley Trophy Race and Jimmy Rush the Championship with 62 points. Parker took a third in the race and a second in the Championship with 52 points. Ron Paine's and Walter Bowles' earlier successes left them tying for third place with 47 points in spite of their having gained no points in this last race. Ron Paine was fifth with 46 points.

SIDDELEY CHALLENGE TROPHY RACE HEATS

Racing No.	Reg'n.	Entrant	Pilot	Aircraft	Engine(s)	Handicap Allowance	Order of Start	Speed	Place
Heat 1									
12	G-AHGZ	Auster Flying Club	C. Gregory	Taylorcraft Plus D	Cirrus Minor 1	1.31	3	111.0	6
16	G-AIGR	Wolverhampton Aero Club	S/L. L. S. Loveridge	Auster 5	Cirrus Minor 2	0.50	2	108.5	7
24	G-AMLH	Newcastle Aero Club	A. A. Bough	D. H. Tiger Moth 2A	D.H. Gipsy Major 1	0.00	1	105.5	4
35	G-AJYZ	London Aero Club	W. P. Bowles	Miles Messenger 2A	Cirrus Major 3	5.57	6	125.5	10
41	G-AEUJ	Vintage Aero Club	A. W. Bedford	Whitney Straight 1	D.H. Gipsy Major 1	4.38	4	124.5	1
45	G-ACYO	West London Aero Club	Miss F. M. Leaf	Miles Hawk Major	D.H. Gipsy Major 1	6.08	7	128.0	9
46	G-ACMA	Northampton Aero Club	A. J. Spiller	Leopard Moth	D.H. Gipsy Major 10	5.45	5	128.0	5
74	G-AIEY	Hampshire Aero Club	P. Hillwood	Percival Proctor 1	D.H. Gipsy Queen 2	8.33	9	144.5	2
90	G-ALZG	Coventry Aero Club	P. Blamire	Miles Gemini 1A	Cirrus Minor 2	7.21	8	136.5	3
96	G-ADGP	Wolverhampton Aero Club	R. R. Paine	Miles Hawk Speed Six	D.H. Gipsy Six	13.58	10	182.0	8
Heat 2									
15	G-ADUR	London Aero Club	W. P. I. Fillingham	Hornet Moth	D.H. Gipsy Major 1	0.00	1	116.0	8
32	G-ALOG	Liverpool Aero Club	S/L. G. C. Wright	Miles Hawk Trainer	D.H. Gipsy Major 1	1.33	2	122.5	6
39	G-AKPE	Wolverhampton Aero Club	D. C. Jemmett	Miles Hawk Trainer 3	D.H. Gipsy Major 1C	1.51	3	123.0	9
73	G-AHNA	Southern Aero Club	A. S. K. Paine	Percival Proctor 1	D.H. Gipsy Queen 2	6.39	5	152.2	2
77	G-AHWR	Brough Flying Club	G. R. I. Parker	Percival Proctor 5	D.H. Gipsy Queen 2	5.32	4	145.0	3
87	G-AHBS	Wolverhampton Aero Club	P. Clifford	Percival Proctor 1	D.H. Gipsy Queen 2	6.46	6	149.0	7
94	G-AKKB	Lancashire Aero Club	F. Dunkerley	Miles Gemini 1A	Cirrus Minor 2	8.47	8	164.5	5
95	G-AECC	Vintage Aero Club	S/L. J. Rush	Miles Falcon Six	D.H. Gipsy Six 1	8.53	9	166.5	4
98	G-AKDC	Elstree Flying Club	J. M. Somers	Miles Gemini 3	D.H. Gipsy Major 1C	7.37	7	159.0	1

HERE AND THERE

RUNNING FROM A BOGIE is the S.E. Baroudeur ground-support aircraft, some notes on which appeared in our issue of June 26. The rocket-propelled launching trolley has already been arrested by its automatic brake and is ready for retrieving and reloading.

Through the Australian Barrier

DURING a demonstration at Avalon, Victoria, last Friday, watched by Mr. Menzies, the Australian Prime Minister, an Avon-Sabre was dived from 52,000ft, reaching 700 m.p.h.—or, according to some reports, "at 900 m.p.h. for five seconds."

Angular Brood

MORE than one reader has had the good fortune to see during the past few days a formation of five Avro deltas in the Hampshire/Surrey area. This comprised the Vulcan and four 707s, and its activities are believed to be not unconnected with the S.B.A.C. Display.

Australian Scientist's Recognition

AMONG those recently elected to Fellowship (F.C.G.I.) of the City and Guilds of London Institute, in recognition of the contribution each has made to the industry in which he is engaged, appears the name of Mr. L. P. Coombes, D.F.C., B.Sc., F.R.Ae.S. Mr. Coombes is chief superintendent of the aeronautical research laboratories of the Australian Government's Department of Supply and Development.

Long-range Jets

TWO formations of F-84 Thunderjets of the 508th Strategic Fighter Wing left Turner Field, Georgia, on August 19th-20th to fly to Lakenheath, Suffolk, and to a U.S.A.F. base in French Morocco—distances of 4,485 miles and 4,475 miles respectively. They made the flights non-stop over unstated routes, flight-refuelling on the way. The object of the exercise, it was stated, was to test the global mobility of American fighter forces. The Lakenheath formation consisted of 20 aircraft under the command of Col. T. S. Olds, Commander of the 40th Air Division, U.S.A.F., and they are staying here for about a fortnight before returning to the U.S.A. The formation's journey constituted the longest non-stop flight ever carried out by single-seat jet aircraft.

"FLIGHT" AND FARNBOROUGH

"Britain's Aircraft Industry"—September 4th: A detailed review, forming a valuable work of reference, of British aircraft and engines; notes on new equipment and a directory to the "ancillary" industry; and a guide for S.B.A.C. Show visitors. This issue—the largest *Flight* has ever produced—will be priced at 2s.

Farnborough Report — September 11th: Vivid, fully illustrated descriptions of the flying and the new aircraft seen on the opening days of the Show. Price 1s. as usual.

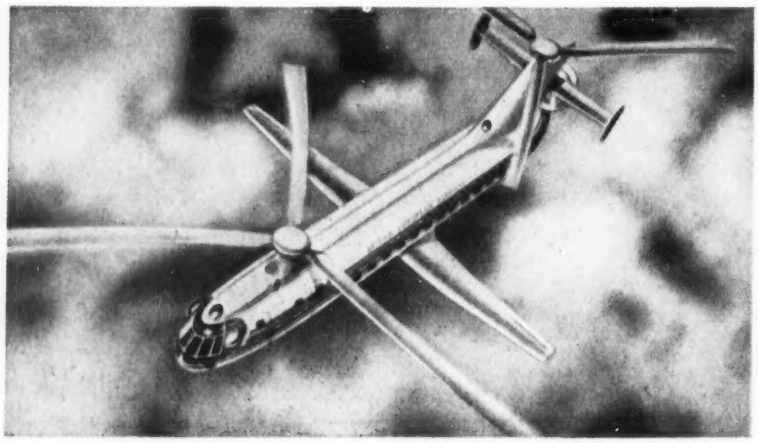
Farnborough Review — September 18th: A detailed appraisal of the week's flying and a further description of the "static" exhibits; 1s.

● *Orders should be placed with newsagents without delay.*

Aid for the S.A.A.F.

G.C.A. has been installed at the South African Air Force Station at Langebaanweg, Cape Province, a training station where, amongst others, pilots for the S.A.A.F. squadron in Korea were trained.

ROTOR-COACH, proposed by Saunders-Roe to meet B.E.A. requirements and depicted here would carry upwards of 50 passengers over ranges greater than 100 miles. A model will be shown at Farnborough.



Saro Designer's Fellowship

CHIEF DESIGNER to Saunders-Roe, Ltd., Mr. M. J. Brennan, B.Sc., has lately been elected a Fellow of the Royal Aeronautical Society and a member of the Institution of Mechanical Engineers.

Brit. I.R.E. President

FOR a second year, the council of the British Institution of Radio Engineers has elected as president Mr. W. E. Miller, M.A. (Cantab.), editor of *Wireless and Electrical Trader*.

Dutch Aerobatic Competition

FLYING their Meteor 8s, the famous "Four of Diamonds" team from No. 327 Sqn., Royal Netherlands Air Force, won the recent aerobatic contest for a challenge cup offered by the Royal Aeroclub of the Netherlands. Second was No. 860 Naval Sqn., in Sea Furies, and third was a Harvard team from Holland Training Command at Gilze-Rijen.

Battle of Britain Service

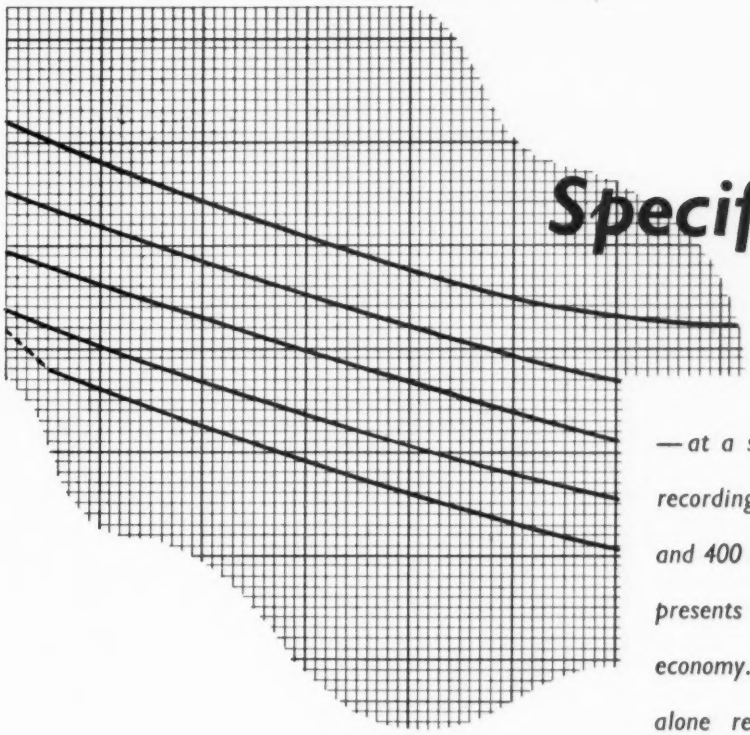
A THANKSGIVING service will be held at 3.15 p.m. on Sunday, September 20th, in St. Paul's Cathedral. Applications for tickets (from widows and bereaved parents of Battle of Britain aircrew, and from retired R.A.F. officers) should be sent to the Under Secretary of State, S.4(d), Air Ministry, Whitehall Gardens, London, S.W.1.

Canberra Innovation

IT is now known that the Martin-built B-57 version of the English Electric Canberra is fitted with a revolving bomb-bay, originally developed on the Martin XB-51 and described and illustrated in *Flight* of August 14th. It may be recalled that this device was developed to obviate turbulence which may be occasioned by the opening of conventional bomb doors and to overcome other difficulties attendant on release at high speeds. Incidentally, the first production B-57 (picture on page 258) made its delivery flight to the U.S.A.F. from Baltimore on August 21st.

Conference Overflow

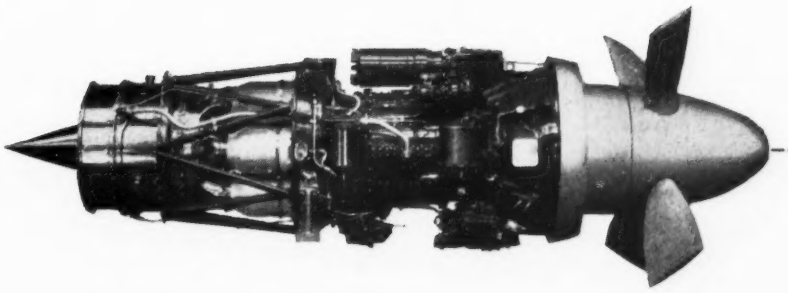
THE Royal Aeronautical Society announces that, as the number of delegates to the Anglo-American Conference will be so great, the lecture-venue is to be changed from Senate House, University of London, to the nearby Friends House, Euston Road. The order of the lectures, as given in our issue of July 31st, has also been to some extent altered. Attendance is limited to delegates, but others will be welcome at the opening ceremony (9.30 a.m., Tuesday, September 13th) and the closing (4 p.m., Thursday, 17th).



Specifically—

—at a specific weight of 0·52 lb./e.h.p. and recording a specific consumption at 30,000 ft. and 400 m.p.h. of 0·48 lb./e.h.p./hr. the Eland presents a prospect of marked operating economy. The reduction of installed weight alone represents a substantial increase in revenue potential of particular value in medium-range inter-city operation.

ELAND



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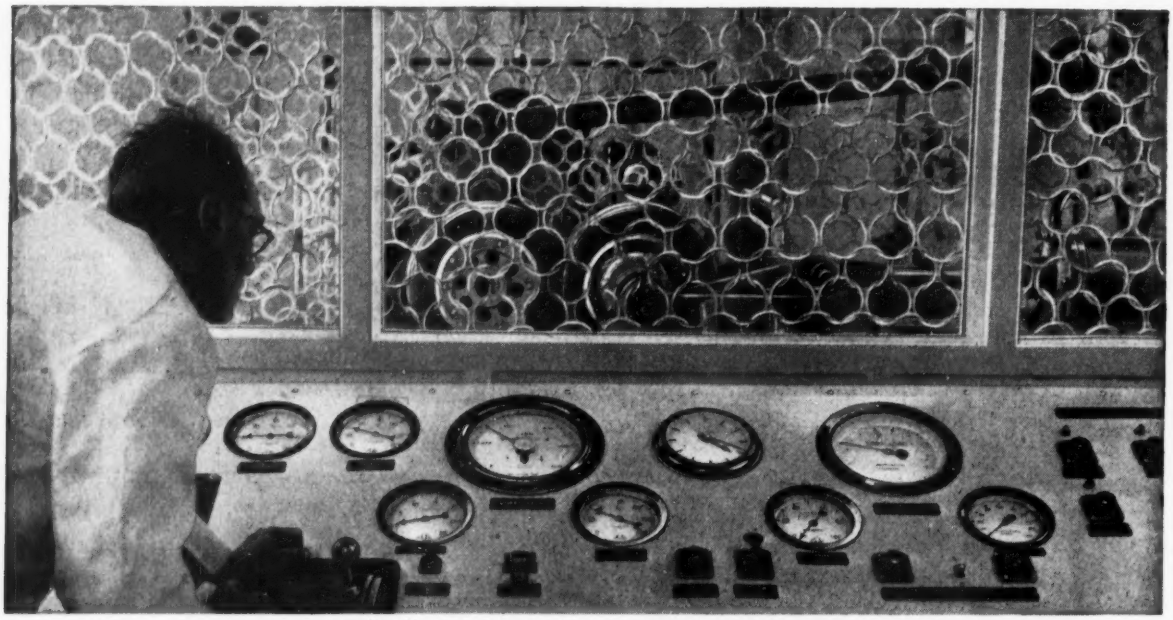
Taking-off, Touching-down, Taxying

NEW TYRE-TESTING MACHINE REPRODUCES HIGH-SPEED JET OPERATING CONDITIONS

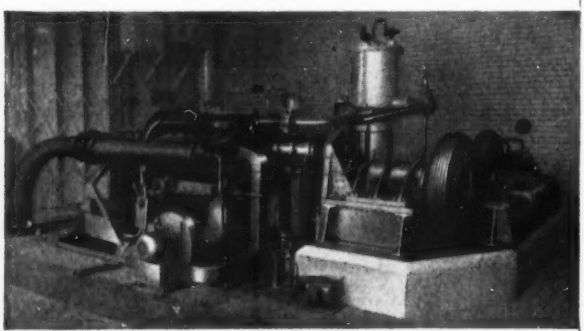


Controlling the progress of an actual test run. The machine can be seen through the double wall of safety glass, beyond the protective steel torpedo netting

PERMITS CLOSE, ACCURATE STUDY OF AERO TYRE BEHAVIOUR

The startling progress of aeronautical design in recent years, so greatly influenced by the development of the jet engine, has confronted the tyre designer with complex problems. Thinner wing sections, which reduce retraction space, create a need for smaller-section tyres. But they also indicate higher performance — and a correspondingly bigger strain on wheel equipment. Just how successfully Dunlop has overcome these problems may be judged by the wheel equipment now fitted to the "Comet," the "Viscount" and many other advanced Civil, Military and Naval aircraft.

An indispensable aid in all this work is test equipment capable of simulating actual operating conditions—both as they are now and as they are likely to be in the future. Here Dunlop has a unique advantage—a test machine that reproduces, for close and accurate study, the complete life-cycle of a high-speed jet aircraft's tyre. Mounted in a specially-constructed, well-protected building, the new plant is powered by a Rolls-Royce Merlin aero engine developing 1,725 b.h.p. at 3,000 r.p.m.—equivalent, with some tyres, to a surface speed of 300 m.p.h.



The test plant, showing the Merlin engine, the test-tyre and, on the far side, the 'slave' tyre and pneumatic ram.

Sudden Strains and Stresses

To reproduce the effect of a loaded tyre travelling over a flat surface, the test tyre is driven against a freely-rotating tyre "spring-loaded" by means of a compressed air cylinder. To imitate a take-off the driven tyre is rapidly accelerated under a gradually-reducing load. For landing, the tyre is rotated at high speed and the 'slave' tyre is pressed suddenly against it under a load of up to 7½ tons. This load is then momentarily withdrawn, to simulate landing 'bounce', and then re-applied for a longer period in imitation of the taxying run. The whole sequence of operations is automatically timed and controlled.

This new machine is undoubtedly a complete step forward in aero tyre testing. Already it has yielded information which is readily translatable into terms of safer, more economical aircraft operation. This valuable data is now being applied in Dunlop designs. By anticipating the needs of the future in this and many other ways Dunlop offers a complete service to the Aircraft Industry.

DUNLOP **RESEARCH** SERVES THE AIRCRAFT INDUSTRY—*Manufacturer, Operator, User*

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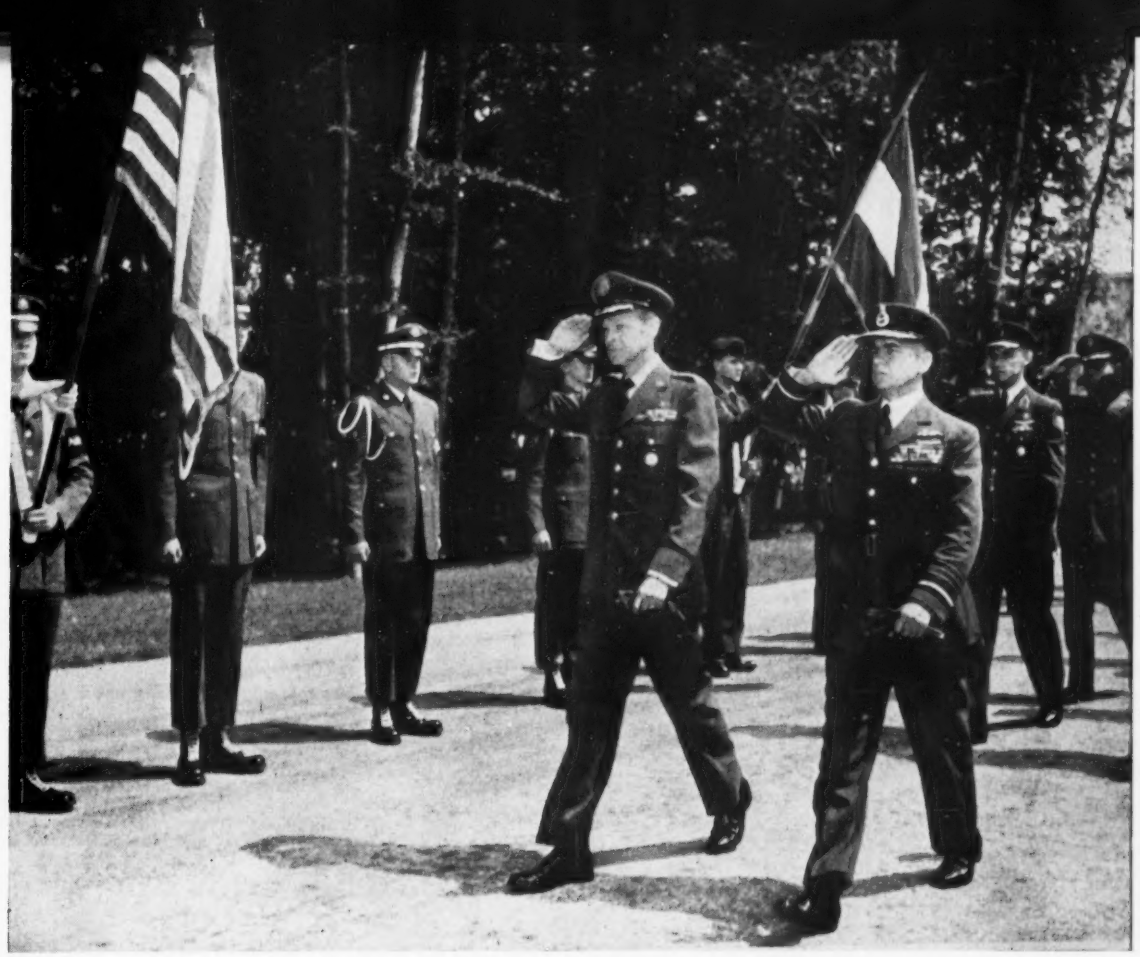

On July 16th last Air Chief Marshal Sir Basil Embry assumed command of Allied Air Forces Central Europe. He is seen at the change-over ceremony at Fontainebleau in company with his predecessor, Gen. Lauris Norstad, U.S.A.F. (left).

A A F C E

PART 2

The Present Allied Command

By W. T. GUNSTON

THIS is the second of a series of articles describing the organization and duties of Allied Air Forces Central Europe. The first part, which dealt with the political background and with the formation of NATO, was published in our issue of June 26th.

AS described in Part I of this account, the Headquarters of the Allied Air Forces Central Europe are established at Camp Guynemer in the forest of Fontainebleau, about 40 miles south of Paris. In this second instalment it is our intention to examine the workings of this Headquarters before—in succeeding issues—discussing the two Allied Tactical Air Forces which come under its control.

One of the most convenient ways of doing so is to describe in turn the work of each of the three Deputy Chiefs of Staff at AAFCE who, between them, deal with almost every major problem which arises. We were fortunate in being granted an interview by each of these officers when, recently, we paid a visit to Fontainebleau.

The Deputy Chief of Staff responsible for Administration is Cdre. G. R. Wartena, of the Royal Netherlands Air Force. He put us firmly in the international picture by summarizing the manner in which the various national governments co-operate with the Allied Headquarters in administering and providing for the air forces in the field.

Central Europe in this connection includes France, the Low Countries, Luxembourg and Western Germany—not a particularly great area (about 344,000 square miles), but probably the most important for its size anywhere in the world from the point of view of disposition of military strength. The nations contributing to the strength of AAFCE are: France, the U.S.A. and Canada (4th A.T.A.F.), and Great Britain, the Netherlands and Belgium (2nd A.T.A.F.). Luxembourg, although right in the middle of things geographically, makes no air contribution and, in fact, plays a very passive part in the whole NATO alliance. Western Germany does not at present contribute military forces as such, but may do when the eventual European Defence Community is established, as was described in our issue of June 26th.

The contribution made by each nation is decided by the North Atlantic Council with, of course, the agreement of the national government concerned. The appropriate department of the country concerned—in Great Britain the Air Ministry—then allocates men and material in the normal manner until the appropriate strength has been reached, the actual location of any particular unit being left largely to the discretion of the A.T.A.F. commander. There are, of course, many exceptions to this basic arrangement and, in particular, defensive fighter squadrons of the Low Countries are disposed largely according to the wishes of the staff of the Dutch and Belgian Air Forces.

When a unit has taken its place in one of the two A.T.A.F.s, it immediately comes under the control of the A.T.A.F. commander, whatever his nationality may be. It also comes under the supervision of its national government, although it is unusual for a national staff to control the operational work of any particular A.T.A.F. unit. At any time, of course, one squadron can be withdrawn from an A.T.A.F. and replaced by another of equal strength and character and, in the case of the British elements of the 2nd A.T.A.F., it is quite normal for the Air Ministry to post in additional units over and above the compulsory commitments as laid down by NATO.

Each unit in the field is still the responsibility of its own national government as far as logistics, pay and general provisioning is concerned. To this extent, it makes no difference if a formation is part of an international organization or not. On

A. Cdre. C. D. C. Boyce
(United Kingdom)
Secretary General

Cdre. G. R. Wartena
(Netherlands)
D.C.O.S. (Admin.)

Gen. de Brig. Ae. G. M. de Chassey
(France)
A.C.O.S. (Plans and Policy)

A. Cdre. T. C. Dickens
(United Kingdom)
A.C.O.S. (Operations)

A A F C E PART 2 . . .

the other hand, there are items which are financed out of international monies, and the establishment of a clear-cut code as to what these items shall be has proved one of the most trying problems yet faced by the planning staffs.

This unavoidably leads to that frightening word "infrastructure." Broadly speaking, infrastructure is the term applied to any fixed permanent installation which is absolutely essential for the support of an armed force in the field. Typical examples are roads, airfields, gun sites, permanent telephone systems, fuel storage depots and the like. Infrastructure in all its shapes and forms is reckoned as an international requirement, and is therefore paid out of common NATO funds. On the other hand, most mobile equipment is nationally financed, as also are "non-essential" installations such as dependents' housing and recreational facilities.

When it comes to an actual exercise there is, as may be expected, a considerable amount of borrowing even on an international scale. An enterprising local French commander might, for example, organize himself a complete set of mobile kitchens from the U.S.A.F. if he knew such equipment to be available. But where a new item is bought, then the national government pays.

Where an international Headquarters is to be established, it is the general rule that the host country, i.e., the country in which the H.Q. is to be situated, provides the land free of charge. Public tenders are then sent out for the construction of the buildings, and it is the normal practice to accept the lowest tender made by any reputable firm. This makes it impossible for any partiality to be shown in the award of contracts to any particular country.

To date, the Allied Tactical Air Force Headquarters are not recognized by the Standing Group, so all administrative questions are handled by the A.T.A.F.s along national channels. The Second A.T.A.F. H.Q. is at present almost entirely British, for a variety of reasons, but it will shortly move nearer to the Dutch frontier and will have a progressively increasing proportion of representatives from the Low Countries. The Fourth A.T.A.F. H.Q. has started to set up an integrated staff whose nucleus has been approved.

Republic F-84 Thunderjets form the backbone of AAFCE's offensive power. This is the U.S. 36th F/B. Wing.

One of the reasons for the slow progress in the establishment of truly international staffs is the extreme difficulty experienced by small countries in providing sufficient officers of the required calibre. Even at AAFCE, the United States and United Kingdom provide between them 62 per cent of the total staff, some 30 per cent being British. On the other hand, the Netherlands are finding it extremely difficult to fulfil their modest staff commitments; at present, they have some 15 officers at AAFCE and seven in the 2nd A.T.A.F. *via* 69 Group. This is the absolute limit as far as the Dutch are concerned without crippling the strength of the staff of their own Air Force. (We quote the Netherlands simply because Cdre. Wartena, being a Dutchman, knew these figures from his own experience; the same sort of thing applies to other NATO countries).

This shortage of suitable staff officers is being gradually overcome by a series of courses run at the U.S. General Staff and Command School, and the R.A.F. Staff College at Andover. Specialist personnel may also be selected by national defence ministries for courses at the NATO Defence College in Paris. Occupying part of the Ecole Militaire buildings, the College is at present commanded by Admiral Lemonnier, of the French Navy. Two classes, each of 50 students, have now completed the six months' course at this College, and their influence is already making itself felt. This College is financed out of the SHAPE budget. Altogether, the position is rapidly becoming much happier, and in about two years the two A.T.A.F. Headquarters should be truly international with representation from each country according to the strength of that country's material contribution. At the moment, however, for better or worse, the Americans and ourselves are carrying the brunt of the staff load.

Operationally, however, the six nations have divided their effort on a very fair basis and, although in the past the lion's share has been handled by the U.S.A.F. and Royal Air Force, the smaller nations are now providing a rapidly increasing proportion. Altogether, the Central European air forces have already reached the stage where they, in General Norstad's words, "could do something useful if attacked."

Actually, the operational strength of the two A.T.A.F.s has increased approximately fourfold in the past two years, during which time General Norstad has been the Commander-in-Chief. In fact, the present tactical striking power is greater than has ever before been based in this part of the world, either in peace or war. A strong modern air force of this type makes great demands in respect of airfields and other infrastructure, and the permanent work undertaken to meet this demand is of absorbing interest.

In 1950, the rather disconnected units of the various national air forces occupying Germany were based at whatever airfield they happened to find convenient. From the point of view of defence against attack from the east the location of the various units was quite unrealistic; the following passage from General Eisenhower's report at the end of his term as Supreme Allied Commander, Europe, in April, 1952, is relevant. It refers to the situation in 1951:

"The greatest concentration of Western air and ground strength was in Germany. Organized within American, British and French zones, the forces were deployed for the purpose for which they were designed—occupation and police duties. Their deployment had no relationship to what would be suitable in resisting attack. Airfields were crowded up in the forward areas, in some cases east of the ground troops that must cover them. Supply lines for British and American forces, almost parallel to the front, ran to the North German ports of Hamburg and Bremerhaven instead of rearward through France and the Low Countries."

A. Cdre. A. M. Rodgers
(United Kingdom)
Chief, Special Air Staff

A.V-M. J. L. Plant
(Canada)
D.C.O.S. (Logistics)

Gen. de Corps Ae. P. J. Fay
(France)
Chief of Staff

Brig.-Gen. I. L. Farman
(U.S.A.)
A.C.O.S. (Communications)

Col. A. A. Esmanne
(Belgium)
Cmd. Relations (Plans and Policy)

A. Cdre. R. N. Waite
(United Kingdom)
A.C.O.S. (Intelligence)

Brig.-Gen. D. D. Hale
(U.S.A.)
D.C.O.S. (Operations)

Such a condition is not easily remedied, and a whole year later General Matthew B. Ridgway, in the same report for the period 1952-53, wrote "the inadequacy of the air forces was particularly acute. Many units were deployed in exposed areas east of the Rhine with no proper re - deployment sites"—this referring to May, 1952.

The only solution was to build an integral network of airfields in carefully selected sites of a type suitable for all types of aircraft that are at present visualized. This may at first appear a surprising decision, for there are those who feel that, whatever else Europe is short of, there is a surfeit of disused aerodromes. But taxpayers may rest assured that the huge expenditure necessary for this project has not lightly been allocated, and the writer is of the opinion that this airfield building programme is one of the finest things that the Central European air forces have ever undertaken.

The lack of suitable airfields was first recognized by the Western Union countries in 1948, and, under the terms of the Brussels Pact, they agreed upon expenditure of £33m, and then £79m, with which a number of airfields around the west German frontier were laid down. But, such is the rapidity with which modern aircraft develop, that these 1948 vintage bases have already been superseded by the present standard NATO layout. Since it is over a dozen years since any comparable airfield building programme was initiated in this country, the type of layout decided upon is of great interest.

The opportunities of this period are, of course, immense. There is at present a whole network of these NATO airfields being laid down to a generally uniform design which takes advantage of every wartime lesson, and every modern constructional technique. And, since they are basically infrastructure, they are financed by the international NATO programme. At the beginning of this year, 126 airfields had been approved for construction, of which AAFCE have 100—41 in France, 31 in Western Germany, 14 in Belgium, 13 in the Netherlands, and one in Luxembourg. Ninety per cent of these bases are either under construction or in use, which speaks volumes for the immense effort which has been put into the whole programme.

The first thing that had to be done was to establish a broad basis of strategic policy which would, in turn, dictate the location of each airfield. This policy had, furthermore, to take into account any foreseeable future development, for airfields are both costly and immovable.

The policy was based on the assumption that attack would come from the East, across Germany, and that the NATO ground forces would not be able to hold any line east of the Rhine. This immediately nullified the effectiveness of the U.S.A.F. bases in the U.S. Zone of Germany (such as Fürstenfeldbruck, near Munich, and Neubiberg) which, in 1951, were admittedly powerful bases, but were exposed and incapable of retention against heavy ground pressure. Again, their aircraft, mainly F-84s, had nowhere else to go—at least, nowhere else from where they could operate.

Defence in depth was the obvious solution, with a "front line" of airfields somewhere along the Rhine. Accordingly, the sites were selected in the general areas along the frontier of Germany with France and the Low Countries, covering a depth of some hundred miles. Included in the 100 were a number of existing airfields, but these were accorded nearly as many man-hours of work as were untouched farmland or forest. Once a site had been selected, the national government concerned was notified of its location, and agreement reached with the local landowners regarding compensation and resettlement. The host government would then be required to provide the land—1,100 acres—and basic utilities, such as electric power, sewerage, and water supply at the rate of 40 gallons per man per day.

The actual construction would then be undertaken by a civilian contractor, in co-operation with engineers of the occupying air force. In Germany, the U.S.A.F. have virtually no tactical bases in the American zone; those formerly used have been relegated to use as rotational training bases. The main U.S. strength lies in the French zone (where the U.S.A.F. negotiates through the French occupying authorities) and back across a wide area of France. Around the Metz/Saar area four of the new airfields have been allocated to the Royal Canadian Air Force, for in this sector the ground forces include the 1st Canadian Brigade; Canada is, of course, a member of NATO. Farther north lies our own 2nd T.A.F.—in this connection forming a part of the 2nd A.T.A.F.—and this powerful force has its fair share of the new bases. Finally, there are the NATO elements of the local national air forces—the French 1st Air Division, and the Belgian and Dutch formations of 83 and 2 Group, and the local defensive fighter squadrons, some of which will occupy NATO airfields.

In order to reduce things to a common denominator, and thereby ease the problems of those who allocate international money, the infrastructure label is applicable only to what is termed a "basic operating platform." This centres upon a single runway, 8,000ft in length and 300ft in width. It is a well-made runway, laid from concrete and stressed to carry 300,000 lb aircraft with tyre pressures over 150 lb/sq in. As long as this runway is present the base is listed as "able to be used." The sketch on page 251 shows the proportions of this basic operating platform, and also indicates the extent of the dispersal areas. With modern military aircraft wind direction is of comparatively minor importance, and, in fact, aircraft can be scrambled from either end of the runway—up- or down-wind.

The rest of the infrastructure consists of hard standings, a parallel taxiway (which can be used as a secondary runway), aprons, a control tower, a heated hangar with a minimum covered area of 60,200 sq ft, operational rooms, maintenance workshops, fire stations, fuel storage depots and internal roads. This completes the internationally financed work, and the cost is generally taken as £2.5m per base.

Over and above the infrastructure, most air forces—certainly the Canadians and Americans—spend up to £4m on such things as dependents' housing, PXs, theatres, schools, and in some cases swimming pools (not such a luxury as they appear, for a good pool is considered a useful training aid). Additionally, most air-

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fields finish up with two or three hangars in addition to the one put in by NATO. All the extra facilities are, of course, nationally financed.

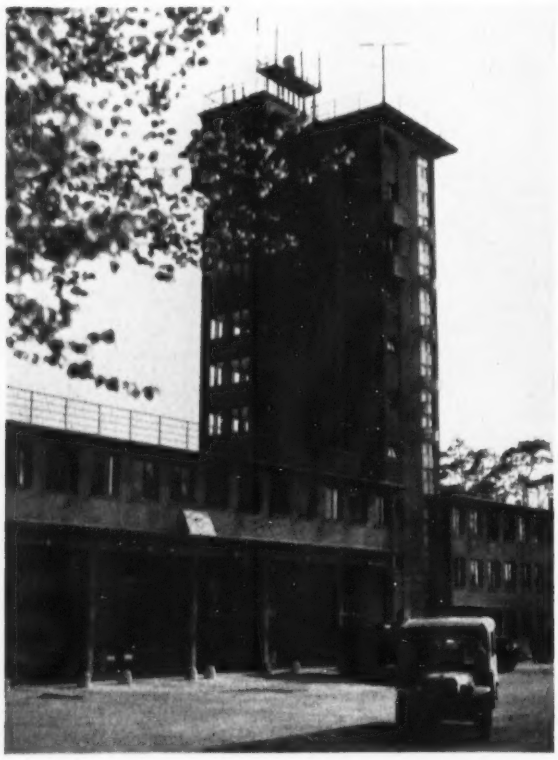
As each airfield is finished, advance parties from the appropriate air force move in and become familiar with the place. At the same time the paraphernalia left by the construction gangs is removed and landscaping—sometimes quite ornate gardens—begins to brighten the appearance of the camp. Next to arrive are such things as signals, radar, spares and general stores and, a week or two later, the base is bristling with transport, private cars and bright yellow fuel bowsers. Finally, the aircraft arrive. The usual establishment is one wing per base, whether the aircraft are for close support or top cover. (One wing is, in NATO, taken to mean three squadrons of 15 to 24 aircraft each).

Anyone with a mathematical bent will possibly have begun to appreciate that 100 wings of jet aircraft (AAFCE will shortly be 100 per cent jet) are likely to burn fuel at a fearsome rate. This is the problem of Air Vice-Marshal John L. Plant, R.C.A.F., the Deputy Chief of Staff (Logistics) at Fontainebleau. He told us that, when they are operating at intensive rates, the two A.T.A.F.s can consume some 20,000 tons of jet fuel per day. To this must be added petrol, diesel fuel and lubricant—and, of course, a roughly similar quantity of fuel for the armies of ALFCE.

A supply problem of this magnitude demands courageous thinking, and the AAFCE planners had to start with the certain knowledge that the requirements were far beyond the capacity of the existing road and rail facilities. It was not long before it was seen that the only practical solution was to pipe fuel direct from the Channel ports to distribution points in the neighbourhood of the various consumers. This decision is typical of AAFCE; nothing like it has ever been done before in peacetime (approximate parallels are the fuel pipes across much of the U.S.A. and Middle East, and "Pluto," which did so much good for the allied armies in Europe in 1944-5).

Having taken the decision to pipe the fuel, the immediate question to be faced was "who pays?"—a question which keeps on cropping up in every NATO activity, for international construction is by no means as common as it perhaps ought to be. In the event, the pipeline rates as infrastructure and is therefore internationally financed. The final cost is uncertain, but it may be recorded that the first sum laid aside for the foundation network of the AAFCE pipe system was £17,900,000.

Typical infrastructure: the control tower at Landstuhl, one of the new airfields allotted to the U.S. 12th Air Force.



AAFCE's top cover is largely provided by Sabres. These belong to a 2nd T.A.F. conversion flight.

At present there are to be three pipes, with an aggregate length of 2,000 miles, starting at Le Harve, Donges and Marseilles. Initially of some 12in diameter, they will taper off to about 6in pipes at their other ends, and will terminate at three main depots in the Cambrai area, and at others at Chalons and Dijon. These depots will be inter-connected, and from them fuel will be pumped to any of three ring systems which will, in turn, serve the airfields. *Flight* recently received a letter from a Dutch correspondent in which he described (his story is unconfirmed) the construction of another series of pipes from Rotterdam to Ypenburg and Volkenburg (two major bases near the Hague) which should be completed this year. And outside the AAFCE area, we know of other systems being laid down in Italy and elsewhere.

At any rate, the project is on a huge scale, and it is heartening to know that plans have been drawn up, the work has gone out to civil contract, and construction is proceeding apace. When we expressed fears of sabotage, we were told that a pipe was hardly worse than any other ground installation from that point of view and that, in any case, nothing else could do the job. If the international situation continues to improve it is possible that the pipes will not be used, for the oil companies can cope with the A.T.A.F.s by normal surface transport when no intensive flying is being done. If they are used, the pipes will probably be required to handle a number of grades of fuel, and this can be readily done with a water plug—or merely by wasting about one hundred yards of fuel at the junction between the two grades.

The standard fuel for the R.A.F., and a number of European air forces, has always been kerosine—otherwise known as AvTur AvKer or JP-1. Attractive as this fuel is from the standpoints of calorific value, safety, behaviour under low pressure and high temperature, and other aspects, it is now generally agreed that there just is not enough of it. Wide-cut petrol, by definition, includes a much higher proportion of the usable fractions of the basic petroleum and this increased yield has placed it in a favourable position in the eyes of the air force logistics planners.

Variously styled wide-cut petrol, wide-cut gasoline, AvTAG (turbine aviation gasoline) or JP-4, this new fuel is becoming the world-wide standard for military aircraft. At present, British aircraft in AAFCE—used by four of the six air forces—are switching to AvTAG. They can, in emergency, use the U.S.A.F. JP-4 but this entails a penalty in range and in permissible altitude. The American-designed aircraft, on the other hand, can use our AvTur in emergency without restriction, for kerosine is a more forgiving fuel. If necessary it can be poured into tanks already half-full of AvTAG. But, where a 4th A.T.A.F. machine puts down at a British base, or *vice versa*, it is common practice to send a bowser along from its home base—a procedure that is strictly confined to peace-time.

All this discussion of fuels underlines what is probably the second biggest problem that AAFCE is facing: how to achieve true mobility and true interchangeability and standardization of spare parts and equipment. The more one studies the problem the worse it looks, but it is being tackled methodically, from "the ground up" as, of course, it must be. Already NATO has a standard screw-thread (a 60 deg pattern with a flat crest, but with a rounded root), from which numerous screws and bolts are now being made. The same sort of work is going into the standardization of all the thousands of bought-out components that go into a modern aircraft—such as screws, ball and roller bearings, electronic valves, and tyres. And anything that requires a special tool for its maintenance is severely frowned upon.

Another, less obvious, headache for the standardization committees concerns aircraft starters. Few things can be more exasperating than to have a squadron of modern fighters standing impotent on an airfield at a time when they are urgently needed. Today such a condition could arise, for the various types

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the pilot At 31 years of age, Neville Duke, Chief Test Pilot at Hawkers, is the holder of an impressive and distinguished record, and was recently awarded the O.B.E. During the war he won the D.S.O., D.F.C. and 2 Bars, A.F.C. and Czech. Military Cross. He was credited with 28 confirmed victories. Since then he has contributed his services to the Empire Test Pilots School, High Speed Flight, and The Ministry of Supply's Establishment at Boscombe Down. He has served as C.O. of 615 Squadron, Biggin Hill. Of the Shell and BP Aviation Service he has this to say :— "I have always been provided with prompt and efficient service by Shell and BP."

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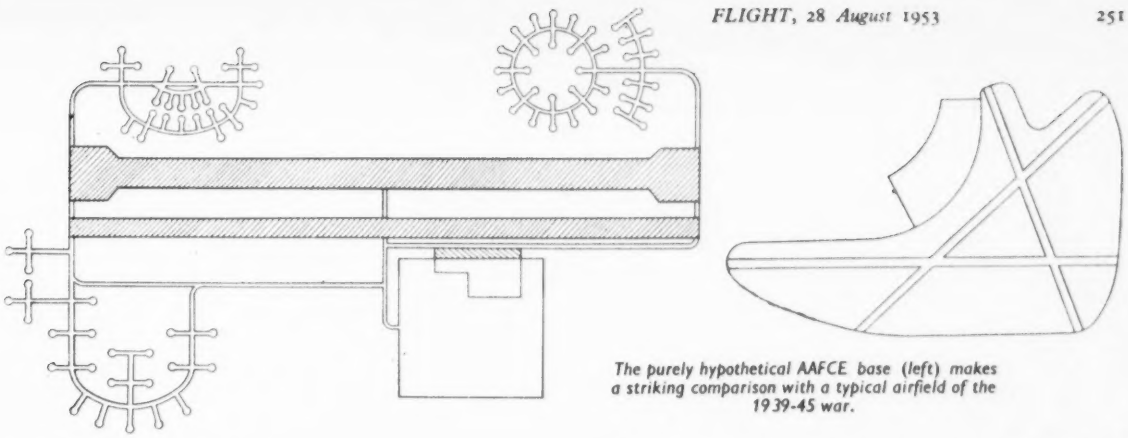


The purely hypothetical AAFCE base (left) makes a striking comparison with a typical airfield of the 1939-45 war.

AAFCE PART 2 . . .

of electric starter in use can make demands quite outside the capacity of available generating sets. At the present time work is being completed enabling American starters to be supplied from batteries. But batteries able to supply the amperage needed by a big turbojet are extremely heavy, if they are to start a whole squadron, and this directly conflicts with the AAFCE aim of complete tactical mobility. Perhaps we have the best solution with our liquid-fuel and cartridge units.

At the moment the only non-electric starters in AAFCE are the B.T.H. cartridge units of the Venoms and Canberras. Soon, propyl-nitrate units will appear, and the Americans are to bring in AiResearch gas-turbine-compressor pneumatic starters.

As for ordinary spares, it is generally agreed that these should be lumped together into huge international centralized stores. This may, in fact, be tried later on, but such provision is now made on a purely national basis—although there are many bi-lateral agreements. It must, at this point, be said that the M.D.A.P. have done well to provide the A.T.A.F.s with so many F-84 Thunderjet fighter/bombers, for these are now standard equipment in nearly every NATO country, and they can put down wherever they like in the knowledge that they will receive servicing from personnel familiar with the type.

The last person we spoke to at Fontainebleau was Air Commodore T. C. Dickens, R.A.F., who holds the post of Assistant Chief of Staff, Operations and Training. In this appointment he was standing-in for Gen. Dudley Hale, U.S.A.F., to whom he is normally deputy.

He outlined the work of his department as operational co-ordination, planning and the perfection of control and reporting procedures. Almost at once the talk turned again to standardization problems. To achieve the complete mobility desired—over the whole of Europe west of the Iron Curtain—standard equipment and procedures are regarded as essential. And as a greater goal, the AAFCE staff are working upon the standardization of ground facilities of all kinds—servicing, radio and radar, fighter direction, early warning, ammunition provision, and everything else.

The AAFCE training staff is very busy—particularly at this time of year—mounting and conducting exercises, and analyzing the results. Once the purpose of the exercise has been laid down, the A.T.A.F. commanders are told first what they must, or must not, do, after which they are given a fairly free hand as regards day-to-day tactics. Before the start, AAFCE collects any international equipment required, such as extra telephones or ammunition, and arranges for everything to be on hand when the A.T.A.F.s need it. It may be added that certain aspects of each exercise are directly controlled and very closely watched, at first hand, by AAFCE.

The operations H.Q. at Fontainebleau has a staff made up of British, American and French (about 21 per cent each) and Canadians, Dutch and Belgians (about 12 per cent each). Language difficulties are not great. Most of the staff speak English—as do many of the A.T.A.F. squadron pilots—and everyone knows "pilot's English", with its international bogies and tally-hos. French, also, is being mastered by a high, and increasing, proportion of the staff, and a clearing house is now run for others who only write French.

Staff appointments, incidentally, are agreed at the highest levels of the NATO council or SHAPE (Supreme H.Q., Allied Powers Europe) as being allocated to a particular nation. A.Cdre. Dickens himself, for example, was posted by the Air Ministry to fill a job marked "R.A.F." It is, therefore, of interest to note that, since our tour of AAFCE, the overall command has passed from General Norstad, U.S.A.F. (who must be looked upon as the "father" of AAFCE) to Air Chief Marshal Sir Basil Embry, R.A.F.

Gen. Norstad's present appointment is that of Air Deputy at SHAPE—formerly held by Air Chief Marshal Sir Hugh Saunders, R.A.F.—which has been enlarged somewhat. The Air Deputy now not only advises the Supreme Commander (Gen. Gruenther, U.S. Army) on all matters of air policy, training, co-ordination and operations for the whole of Europe, but he has direct control of any air forces not allocated to subordinate commands. He can also call upon such help as strategic forces can give in the light of their overall commitments. Such forces include the U.S. Strategic Air Command and our own Bomber Command. To make things quite clear, it should be understood that no national air force is being asked to relinquish control of its own squadrons, but since it is, in Gen. Norstad's words "all one battle", AAFCE and the Allied forces of Northern and Southern Europe have a right to call on strategic bombers.

To return to AAFCEs Operations staff: procedures lean rather towards those of the U.S.A.F., but many British features are evident. The Air Commodore put it that they embodied the "best, or worst, of both worlds". At least it is known that any R.A.F. or U.S.A.F. officer can come straight to AAFCE and work the system, and there have been no complaints from the other countries. Operational procedures are, in fact, now at high level of efficiency. Many realistic exercises have so streamlined things that virtually no further development is foreseen, although

Night defence rests in the hands of Armstrong Whitworth N.F. Meteors; this one is based at Ahlhorn.

A A F C E PART 2 . . .

daily tests and minor exercises are kept up to ensure that no slackening off occurs.

A continuous series of exercises is also maintained to test the AAFCE control and reporting systems. The establishment of a really comprehensive and foolproof early-warning, search, plotting and reporting network is, at present, one of the biggest headaches, and a very great deal remains to be done in this sphere. The trouble partly stems from a shortage of trained personnel: some thousands of both military and civilian observers are needed if air movements over the whole Central Europe area are to be followed continuously.

This can be met, but a more serious shortage exists with regard to up-to-date radar equipment, essential for the proper detection of high-performance aircraft. At present, nearly all the warning sets are either of wartime construction or design, and many have far exceeded their allotted span of operating hours. When new equipment was first needed, about 1948, orders were placed for sets then available and specifications were issued to firms both in this country and in America and France, but very little has yet been delivered. We are not going to dwell on this subject, but will refer to it again in the two remaining articles of this series.

As to the lack of trained radar technicians, which is still severe —just as it is in our own air force—the U.S.A.F. deserve credit for setting up a NATO centralized electronic training programme, supported by MDAP and NATO funds and freely available to all NATO air forces. At the Joint Communication Training Centre at Freising, near Munich, they run 23-week courses which, although primarily designed to help the operators of Marshall Aid G.C.A. sets, are also of value in teaching.

Another aspect of AAFCE work, not yet touched upon, is the defence in depth right back through France and the Low Countries. France, Belgium and Holland have, of course, their own national fighter squadrons and, strongest of all, we have our Fighter Command based in the British Isles. All four forces are now linked by the AAFCE Air Defence Division which, in peacetime, exists primarily to co-ordinate the air defence of Western Europe and act as a link with national authorities. The Air Defence Division does not, therefore, directly control aircraft, and has no "strength" of its own. It is at present headed by Col. R. Destillac, who was formerly deputy commander of the French Défense Aérienne du Territoire. His job is to ensure that, if ever AAFCE is called upon to repel attack, it will do so with an integrated series of "fighter commands"—tested and proven—to look after the rear areas with the minimum wastage of effort.

So much, then, for the AAFCE headquarters, from which the two great Allied Tactical Air Forces are controlled. Of the building itself, we wrote briefly on June 26th, when a photograph of the H.Q. at Camp Guynemer was also published. Inside, it gives an impression of spacious modernity. In the entrance hall is a reception desk, at which may be found a policeman and a clerk from the air forces of any of the six nations. Also on the ground floor is the canteen.

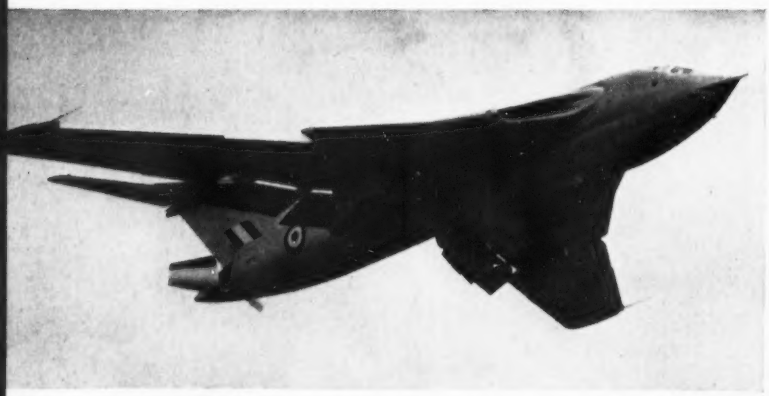
Staffed by N.A.A.F.I. employees, it bears an interesting comparison with the "Naffys" of so many home stations. Not only is the food and drink available fully equal to that found on any American base we have seen—praise indeed—but the whole place exudes an atmosphere of international democracy which is one of our most vivid memories of Fontainebleau. As we lunched, two American majors at the next table were discussing electronics with a corporal of the R.A.F. In a far corner was a mixed group, all ranks from all nations, eagerly studying someone's Coronation pictures. At another table sat a gentleman from an undetermined air force who wore eight stars on each shoulder; this was considered, by the U.S.A.F. top brass, as unfair.

To those who work at Fontainebleau, all this is accepted without thought. But, as a casual visitor, we couldn't help wondering what would be going on there in, say, ten years' time. It is to be hoped that, in the future, Allied Air Forces, Central Europe, will continue to work as they are now. And if they are not needed, let nobody say it was unnecessary to build them up as we are doing now. The two A.T.A.F.s are already a very great stabilizing factor in Europe, but apart from this comforting fact they are instilling in the air forces of six nations probably the finest degree of international co-operation yet practised.

VISITING THE VICTOR

ACCOMPANIED by the Secretary of State for Air, Lord De L'Isle and Dudley, V.C., Mr. Winthrop E. Aldrich, the American Ambassador, and Mr. Harold E. Talbott, Secretary of the United States Air Force, paid a call at Handley Page's Radlett airfield on August 18th. There they inspected the first prototype of the Victor B.1 bomber, now in super-priority production for the R.A.F., and witnessed a demonstration of the machine by S/L. H. G. Hazelden, the makers' chief test pilot. The visitors were also treated to a display by the Hawker Hunter, in the hands of Mr. "Bill" Bedford, who dived it supersonically for the guests' edification.

Mr. Talbott was accompanied by Maj. Gen. F. H. Griswold, Commander of the 3rd U.S.A.F. in Great Britain, Brig. Gen. J. C. Selser, Commander of the 7th U.S. Air Division, Gen. D. F. Callahan, chairman of the Military Assistance Advisory Group to the U.K., Brig. Gen. J. W. Wood, the U.S. Air Attache, Lt. Gen. R. W. Harper, head of the U.S.A.F. Training Command, and members of his staff. With Lord De L'Isle and Dudley was A.V.M. G. W. Tuttle, Assistant Chief of the Air Staff (Operational Requirements).



The normally sturdy-looking Victor appears almost to be disintegrating as (left) it approaches with everything out and down. Below it, Mr. Harold E. Talbott is seen smiling satisfaction at the U.S. Ambassador and Sir Frederick Handley Page after flying the Victor. Below, Mr. "Bill" Bedford ejects himself from the Hunter with the aid of Lord De L'Isle and Dudley and a ground-crew member. (See also page 266.)

"Flight" photographs

ANTI-SUBMARINE

For service in the Royal Navy—Fairey Gannets will operate from Fleet and Light Fleet Carriers. The Gannet is the latest specialised anti-submarine aircraft produced in Britain.

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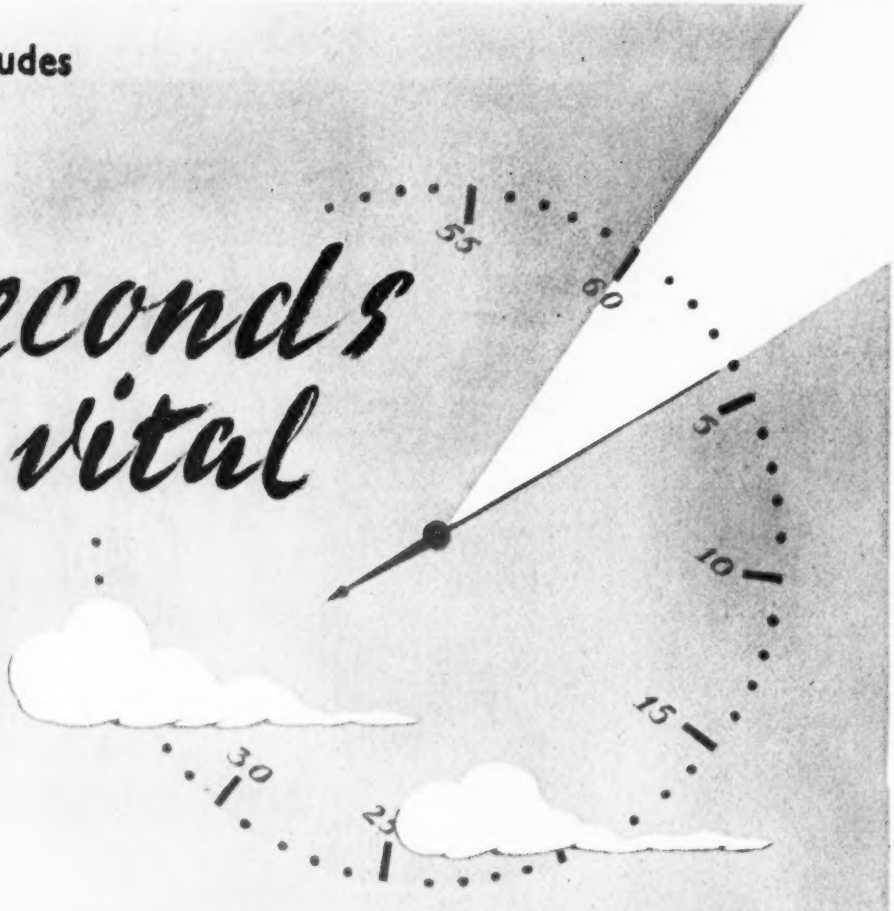

The Martin-Baker Mk. 2 *fully automatic* Ejection Seat is designed to reduce escape procedure to the minimum.

Once ejection is made the sequence of release from the seat is fully automatic and no further action by the occupant is necessary.

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AIRCRAFT INTELLIGENCE

Great Britain

Aquila Flying-Boats. Now under conversion at Southampton into, respectively, a Solent and a Hythe are Seaford 3 G-ANAJ and Sunderland 5 G-ANAK. Aquila Airways are converting these flying-boats for their U.K.-Madeira-Lisbon-Las Palmas network.

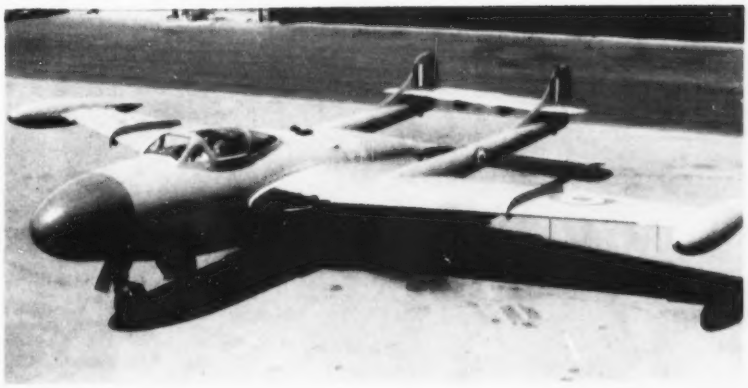
De Havilland Comet 2. It has already been announced that these longer-range Comets will take over some of the B.O.A.C. South American services now operated by Argonauts. In addition, they may be introduced on the London-Tokyo route in place of the Comet 1s, which are at present operating one service weekly.

De Havilland Heron. G-AMSP, a new Series 1 from the Chester factory, made the first Heron transatlantic crossing in June—at about the same time as the Leonides-Beaver was flown from Canada. After completing a series of Canadian demonstration flights it was handed over to the Department of Transport for C. of A. testing. The type will be represented at Farnborough by G-AMTS, an executive version of the Series 2 (flying display), and PK-GHC, the first of 14 Series 1s for Garuda Indonesian Airways.

Blackburn Universal. Improved performance would result from the installation of four Wright Turbo-Cyclone 972-TC-18OAs, each giving 3,250 h.p. for take-off (the standard version has 2,850 h.p. Centaurus). All-up weight would be increased from 135,000 to 145,000 lb, and the maximum cruising speed would be 208 m.p.h. at 11,500ft, compared with 194 m.p.h. at 12,500ft. Take-off run to 50ft, however, would be increased from 1,180 to 1,390 yd.

Australia

Avon-Sabre. According to a statement from North American Aviation Inc., designers of the airframe, production of the F-86 Avon-Sabre in Australia has been facilitated by the furnishing of 100 "ship sets" of detailed parts as well as jigs and tooling by the company. As a result, the initial flight was made less than a year from the start of production. It is pointed out that the Sabre is the third North American type to be built by the Commonwealth Aircraft Corporation, for during the late war that organization produced the F-51 Mustang and T-6 Texan. It is confirmed that the diameter of the Avon-Sabre's fuselage has been increased.



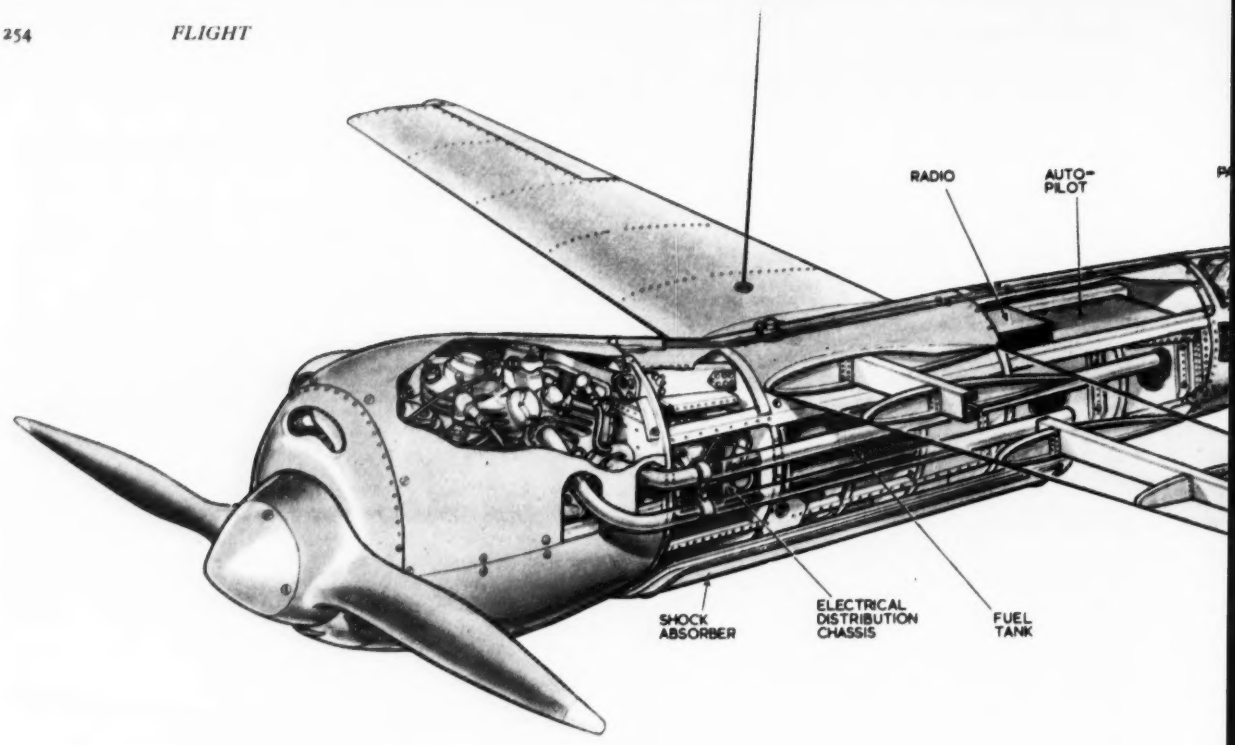
ALL-ROUND IMPROVEMENTS: The de Havilland Venom N.F.3 (top) has the latest type of tail unit, cockpit enclosure and combat equipment, and is capable of attaining a Mach number higher than the N.F.2's. The Lockheed P2V Neptune of the U.S. Navy, below it, has two Westinghouse auxiliary turbojets to supplement the Wright Turbo-Cyclone for extra-short take-offs and speed. At the bottom of the page is the North American FJ-3 Fury with a Wright J65 (Armstrong Siddeley licence).

New Zealand

Flying-boats. In a letter to *American Aviation*, A. V-M. D. V. Carnegie, C.B., C.B.E., A.F.C., Chief of the Air Staff of the R.N.Z.A.F., refers to the replacing of the South African Air Force Sunderlands by Avro Shackletons, and makes it clear that his own Service is definitely not following the same trend. "Our Pacific areas are ideal for the flying-boat from the military point of view," he writes, "and personally I am convinced that the flying-boat will once again come into its own."

Germany

New Gliders. The Bremen-Lane (span 51ft 4in) is of all-metal construction and has a butterfly tail; it is intended as a robust and cheap trainer, but performance is rather better than that expected of such a machine. The Rhonschwalbe is a tandem two-seater with forward-swept cantilever wooden wing and plywood-covered fuselage. It can be flown as a single-seater. Stalling speed is 33 m.p.h., rate of sink 2ft 6in/sec at 34 m.p.h. with one pilot. Intended as a glider which will become a powered aircraft when permission is once more granted, the Dittmar Move resembles the Praga Baby. Flight trials are under way and reports of control-effectiveness are particularly good.



GUIDED MIDGET

M.L. Aviation's Radio-controlled Target Aircraft

IT has long been appreciated that the present method of towing sleeve targets behind a piloted aircraft for the benefit of anti-aircraft gunners leaves much to be desired. Among the many inherent disadvantages may be mentioned the fact that towing must be done in an approximately straight line (even then only with concentration on the part of the crew of the tug) and at a speed and altitude which restrict the range of conditions attainable. Equally important, perhaps, is the psychological discomfort of the tug crew, which makes their task an unpopular one.

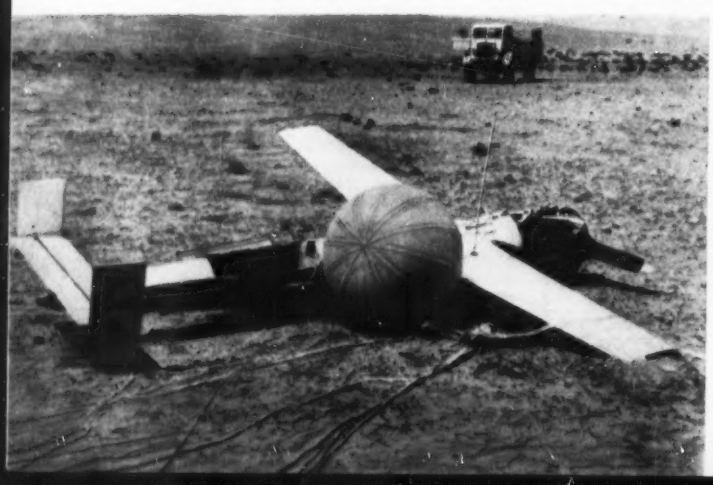
Simple, radio-controlled aircraft have long been used by many countries as targets (e.g., the famous D.H. Queen Bee of the 1930s) and it is of interest to examine an exceptionally neat target by M.L. Aviation Ltd., of White Waltham, Berks. This aircraft, an early version of which was shown on the company's stand at last year's S.B.A.C. Show, is designed to simulate the behaviour of aircraft flying much higher and faster. It is radio-controlled, and can be flown out of sight of the ground, its position being recorded on a P.P.I. tube. Work on the design has been proceeding steadily during the past two years.

Ministry of Supply specification U.120D called for a radio-controlled pilotless aircraft which would provide a manœuvrable airborne target for ground-to-air gunnery, radar plotting practice and similar uses. The design evolved by M.L. Aviation to meet this requirement consists of an all-metal high-wing monoplane, powered by a modified Vincent motor-cycle engine which drives a fixed-pitch wooden tractor airscrew. The vee-tail of the early models (such as the one shown at Farnborough last year) has more recently been replaced by a conventional twin-fin unit, with a full-span elevator surface, both tailplane and fins being of simple rectangular shape. No rudder is fitted.

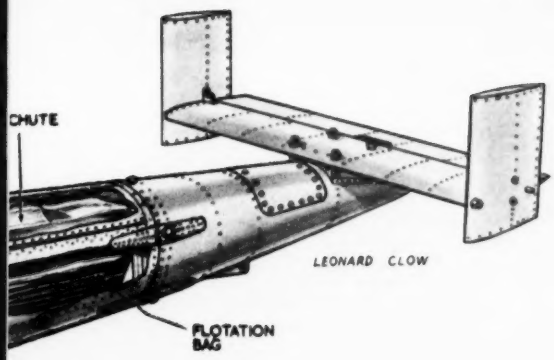
The airframe, of stressed-skin aluminium alloy construction, is manufactured in three sections, easily joined or detached. These sections comprise the one-piece wing, fitted with short-span ailerons; the main fuselage centre-section; and the rear fuselage and tail unit. As shown in the drawing, the fuselage is divided into five compartments housing various items of equipment.

The first bay contains the electrical connections panel, master relays, switches, battery and similar equipment. Behind this is the 5.3-gallon fuel tank and the delivery pump, while the third compartment is reserved for special equipment such as telemetering devices. The radio receiver and the specially designed autopilot are installed in the fourth bay. The rear compartment contains a charged CO_2 bottle and a folded flotation bag, over which is the packed Irving "trefoil" triple parachute. The rigging lines of the parachute are attached, above the c.g., to three steel cables supporting the aircraft in a level attitude during descent. Normally closed, the two-piece, spring-hinged cowling of the parachute bay is thrust open by the rapid emergence of the parachute should the spherical flotation bag be inflated, in response to a radio signal or emergency actuation (described later). The flotation bag ensures buoyancy should descent occur into water, and an air-filled shock-absorbing cushion, which expands as the parachute is released, is fitted below the fuselage to reduce damage should the aircraft land on a hard surface.

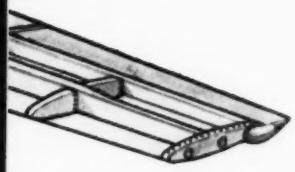
There is no mechanical control system. Plug-and-socket electrical connections are used throughout, ensuring easy uncoupling for replacement or testing. The entire target is constructed on the interchangeable-unit plan, each item being self-contained and quickly replaced should a fault develop during use. The power



On the left is seen an M.L. target about to be retrieved from the desert; the flotation bag and parachute lines are evident. The power plant (right) shows such features as the fuel feed and filter, the starter dog and the chain case to the airscrew gearbox.



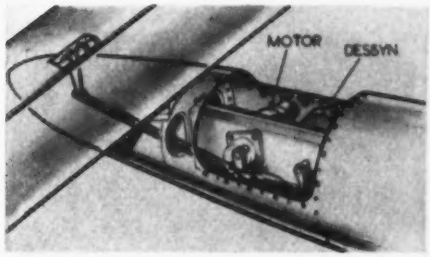
"FLIGHT" copyright drawings

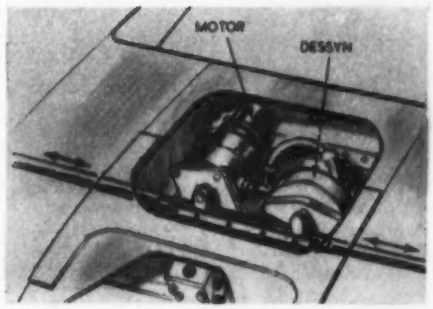


M.L. AVIATION PILOTLESS TARGET
(65 h.p. Vincent Picador Vee-twin Engine)

Weight	472 lb
Span	12ft
Length overall	12ft 6in
Height overall	2ft 9½in
Engine r.p.m.	5,000
Reduction-gear ratio	2 to 1
Airscrew diameter	4ft 6in
Speed at sea level	203 kt
Speed at 10,000ft	190 kt T.A.S.
Duration	45 min
Service ceiling	19,000ft
Fuel capacity	5.3 gal
Maximum diving speed	Specification 250 kt*
Rate of climb (sea level)	2,000ft/min

*A figure of 300-350 kt is expected to be achieved.





The control-system is effected with Dessyns, electric motors and a simple linkage. The elevator (top) and the aileron units are shown, the latter being in the wing centre-section.

unit, for example, is attached to the front bulkhead at only four points; detachment here, and uncoupling of three electrical sockets and the fuel-supply union, are all that is necessary to remove the complete unit.

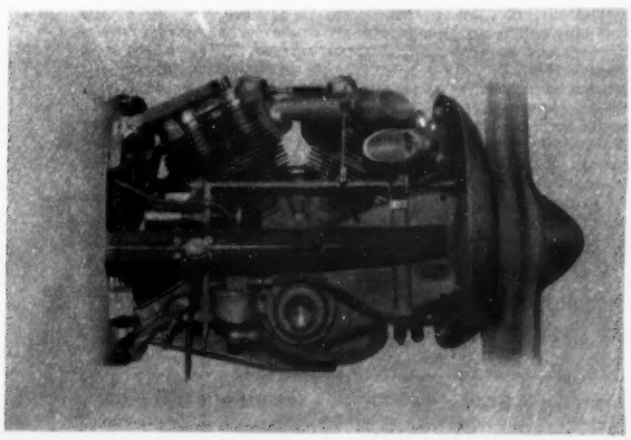
The engine, a modified form of the Vincent Rapide, and known as the Picador, was described briefly in the article "Power for Ultra-Light Aircraft" in *Flight* of June 5th this year. It is a 1,000 c.c. air-cooled vee-twin, weighing 200 lb and developing 65 b.h.p. at the airscrew shaft. No carburetters are fitted, as it employs direct fuel injection into the inlet pipes. The two jets, situated just behind the inlet-pipe butterfly air-valves, are fed by an injector pump driven from the airscrew shaft.

An unusual feature of the engine—though it is normal Vincent motor-cycle practice—is that the cylinders do not lie in the same vertical plane. Thus the roller-bearing big-ends are situated side-by-side on the crankpin without the necessity for offset small-ends. For starting, the camshaft has an exposed dog on the starboard side of the engine which engages with the ground electric-starter normally mounted on the launching ramp (or, as the makers term it, launching easel).

The engine has a chain primary drive to a right-angled twin-bevel gearbox, the overall reduction being 2:1 from the normal engine r.p.m. of 5,000. The airscrew, made by the Airscrew Company and Jicwood, Ltd., is directly mounted on the output shaft of the bevel box. Dry-sump lubrication is incorporated, oil being circulated by means of the scavenge pump.

A common shaft is spring-loaded to hold the butterfly and injector-feed valves open for full-flight r.p.m. An external peg turns the torque-shaft back into the slow-running position for starting and the pre-launch period, and is removed to give full revs just before take-off. The fuel/air ratio is kept constant with varying height by means of a barometric aneroid control. A centrifugal overspeed governor is connected to the feed injector in order to avoid exceeding the specified in-flight r.p.m.

The flight of the aircraft is controlled by a "pilot" on the ground, who is able to transmit by radio a number of command signals such as left or right turn, up, down, and level, the degree of each manœuvre being variable within the aircraft-performance limits. In the aircraft is a radio receiver and an automatic pilot which ensures normal flight stability about the three axes. In addition, the M.L. autopilot interprets the radio command signals from the receiver, and operates the aileron and elevator actuator motors to command an aircraft attitude. It is thus not essential for the aircraft to be within visual range of the pilot for accurate control.



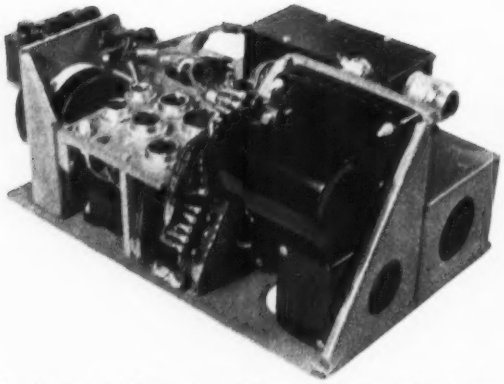
Flight can be terminated over a selected landing area by a command additional to those mentioned above; this causes the parachute to be released, and the engine and electrical services to be disconnected. Use of the parachute at an effective height is guaranteed by a pre-set barometric control which enforces a lower safe-altitude limit during flight unless deliberately over-ridden by a continued "dive" command. The parachute-release is automatically actuated, also, in the event of an engine failure or loss of radio contact with the ground station.

In view of its novel features, this control system is well worth a more detailed study. The ground installation comprises six items: (1) the power unit, (2) the oscillator or tone-generator, (3) a filter unit, (4) a 10-watt transmitter, (5) the ground control box and (6) the aerial; the first four items are mounted as a self-contained group. A 24-volt supply is used. The transmitter radiates a 70-80 Mc/s V.H.F. carrier frequency-modulated by five fixed tones, selection of which is by the switching on the ground control unit. The circuit is so arranged that two selected tones are transmitted simultaneously, energizing two interlocked relay systems in the receiver which are "keyed" to close one output channel, corresponding to a particular command.

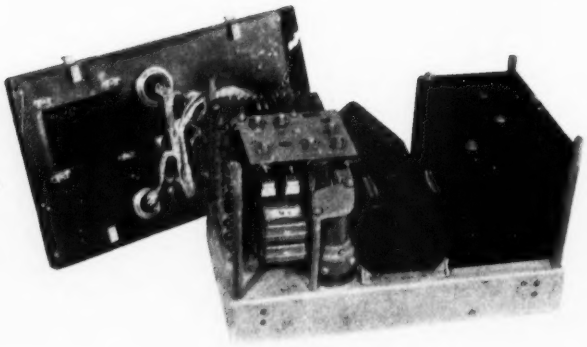
Thus the receiver is not affected by stray radiation from other sources, since for each command the receiver accepts a pre-selected combination of tones. Of the ten possible combinations of two signals, seven are in practice used; the associated commands being up, down, right turn, left turn, level, parachute release, and "radio hold." This last is automatically transmitted whenever none of the six specific commands is being radiated, and serves to keep the solenoid in the master relay circuit energized. It s de-energizing, and the opening of the relay circuit, causes the parachute release to be actuated.

The ground pilot's control box incorporates a miniature control column, which by appropriate movement gives the up, down, left, right and level commands. In addition there is a push-button to actuate the parachute release, and a dial on which the amount of bank required (up to 45 deg) can be pre-set.

The receiver is a frequency-modulated superhet, with a sensitivity of 30 microvolts for full limiter output. It comprises an R.F. amplifier, a crystal-controlled local oscillator with a separate mixer, two I.F. stages, two limitation stages, a Foster Seely discriminator and two A.F. amplifying stages. There are then the five separate tuned circuits of different frequencies which



The battery installation is carried on a common rack with the main electrical distribution chassis. On the left is the height-setting drum switch, reached from the starboard side of the aircraft.



The autopilot chassis carries (left to right): amplifier and relay unit, gyro rotor power unit, roll-yaw gyro (mounted at 45 deg) and pitch gyro, and computor unit containing motors, pendule and bias gearing.

GUIDED MIDGET . . .

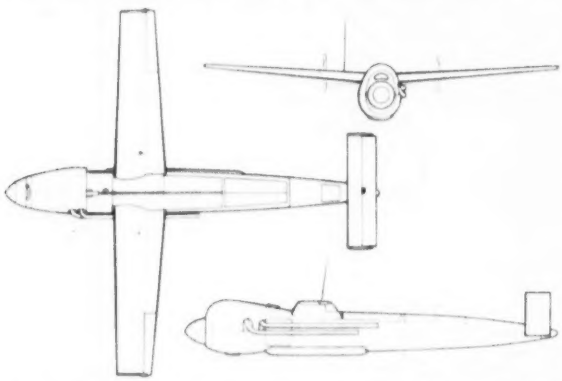
energize the relays (in pairs) to provide "command" contact to the autopilot.

The ingenious automatic pilot is perhaps the most interesting item of all. As mentioned, it performs the functions of an orthodox autopilot, but it also interprets the signals received by radio from the ground and translates them into control-surface deflections appropriate to the required manœuvres, by means of the two electric actuators. Total weight of the unit is 16 lb.

The autopilot incorporates two gyros, a vertically mounted pitch gyro controlling the elevator movement, and another—sensitive to both yaw and roll—mounted at 45 deg. In their stablizing action they follow normal electric autopilot practice. Each gyro is provided, in addition, with a device enabling its gimbal and associated potentiometer wiper to be turned deliberately in response to radio command, so that the actuators operate to put the aircraft into the required attitude for executing a manœuvre as if obeying a "correction" signal from the gyros. In each case, this overriding gyro gimbal deflector is itself controlled by a reversible motor-driven potentiometer, operated by the opening and closing of circuits of selected polarity through relays which are in turn energized through the radio command channels of the receiver.

To eliminate any danger of instability and hunting, all movements are opposed by feedback. For instance, each gimbal control is monitored by a pendulum which registers aircraft attitude about that axis, and balances out the signal at the selected level. Each gyro has also a centering system, which enables it to perform its normal stabilizing duties about the flight axis in any attitude, even when being simultaneously deflected by a command signal.

A mechanically geared computor applies signal correction for the turning commands. When, say, a banked turn is being performed, the aircraft makes a gradual rotation about both roll and yaw axes. Were no restraint applied these component motions would be interpreted by the gyro concerned as a disturbance of stability and a spurious correction would occur. The computor therefore switches a calculated resistance-valve into the circuit to counteract this tendency and to keep the aircraft on its course.



Faintly reminiscent of a control-line model aircraft, the M.L. target has a distinctive outline.

The relay unit (also mounted on the autopilot chassis), in addition to controlling the switching of the command motors, controls the "automatic" circuits such as the relays which short-out the engine magneto and stop the fuel pump when the "parachute" signal is transmitted; the low-height device, controlled by the barometric switch; and the relays which switch over to autopilot control when the launching rockets are expended.

The aircraft is launched from a hinged "easel"-type structure, initial impetus being supplied by two standard 3in rockets which fit (in a tubular frame) beneath the machine and on "zero-length" mountings on the easel. After flight preparation (including engine starting) in the horizontal attitude, the aircraft is elevated to a 15-deg nose-up position just before the launch. The starter motor is on a hinged pedestal on the catwalk around the base of the launching platform. After the rockets have been fired, the target is accelerated to a speed of about 125 kt and a height of approximately 100ft, when the rocket-frame falls away and the machine continues under the control of its ground-based "pilot." For landing, the parachute is always used, no undercarriage or skid being fitted.

Extensive tests of the flying and control characteristics of the first batch of M.L. target aircraft have already been made in this country and in North Africa; in close co-operation with the Royal Aircraft Establishment, Farnborough, tests are continuing here. The R.A.E., indeed, has played an important part in the development of the project (in particular in the ground radio control installation), particularly in the early stages; and it was on original theoretical work from Farnborough that the design and construction of the neat and impressive autopilot by the firm was based. There would certainly seem to be much scope for such an autopilot, responding to radio-control commands as it does, in the field of guided weapons.

With the exception of the engine, airscrew and radio receiver, all parts of the aircraft (which is as yet nameless) have been designed and are being built by the M.L. company at their works at White Waltham Airfield. The quality of workmanship and finish on the machines is high. A Griffon-powered wind-tunnel has been used to study the efficiency of the designed engine air intakes—during the North African trials the machines were flown with the top engine cowling removed—and little modification has been found necessary.

The targets used in these trials have been finished in the standard colour scheme for targets, namely bright red with a light colour applied to the upper surface of the wings. At present this light colour is white, and it has been found that the attitude of aircraft so treated is most readily discernable against typical skyscapes. The expected life of the targets is about 12 hours each, which can be taken as corresponding to some dozen flights. Furthermore, the unit type of construction makes salvage of undamaged portions and their incorporation in other targets a simple matter.

Quantity production of products designed at White Waltham is undertaken at the works of M.L. Engineering, Ltd., on Slough Trading Estate. This factory expects to be producing numbers of U.120Ds before long, for the Army and Royal Navy and possibly other Services. An actual target will be exhibited at the S.B.A.C. show, together with a separately displayed autopilot.

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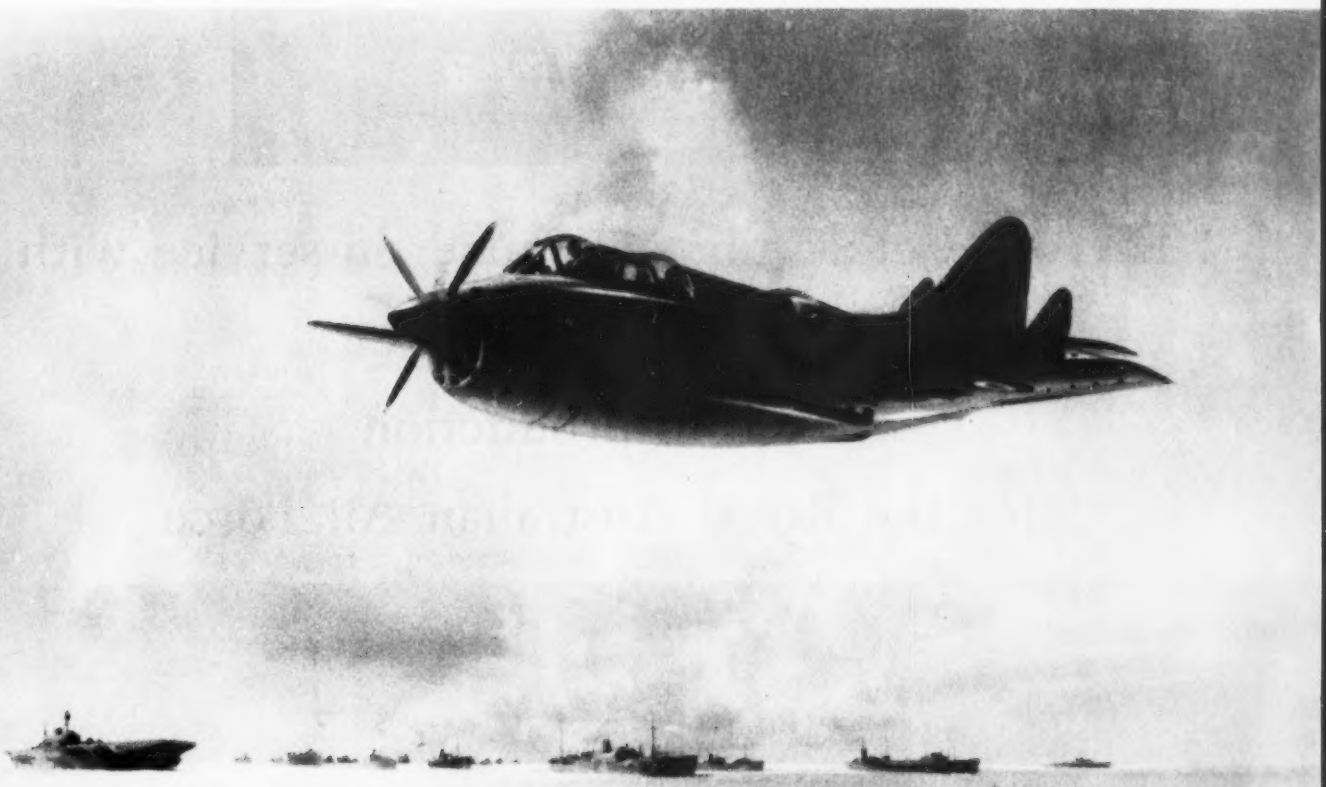
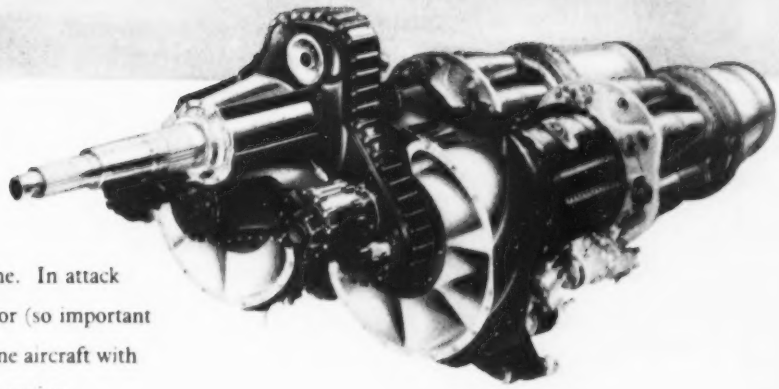
A convoy steams on, unmolested by enemy submarines. A Fairey Gannet returns to its parent carrier, from a long patrol—striking and killing enemy submarines before they can make contact with the convoy.





The great radius of action of the Gannet is made possible by its low fuel consumption patrolling on one half of its Armstrong Siddeley Double Mamba turboprop engine. In attack the second engine is cut in, providing the safety factor (so important for marine operation) and performance of a twin engine aircraft with the fuel economy and stowing advantages of a single engine.

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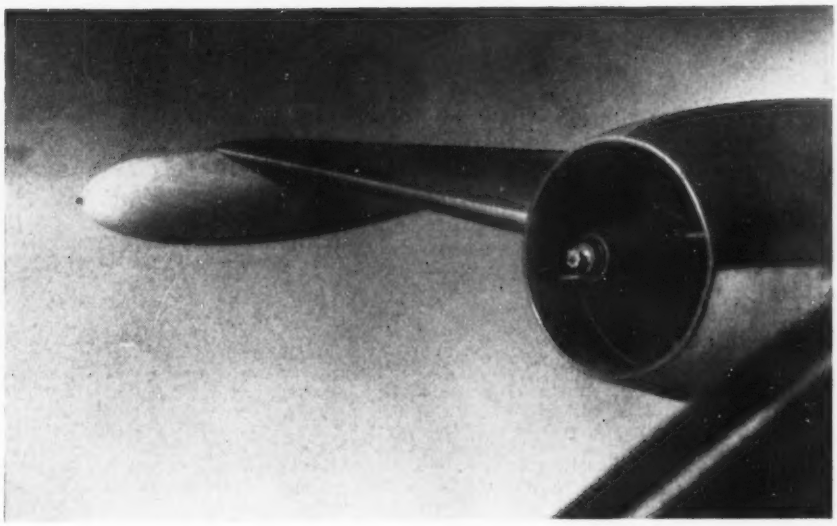
By
THE EDITOR



A Leica-shot from the rumble-seat at 42,000ft and 500 m.p.h. somewhere over the North Sea.

AIRBORNE in a CANBERRA

Personal Impressions of Flying Eight Miles Up

FEW people other than the crews of Royal Air Force Bomber Command have as yet had the good fortune to take a ride in a Canberra. And mere words can give only the most superficial impression of what such flying is like. It is no exaggeration to say that this kind of aviation is a definite step towards the sensations predicted for space travel. During the recent defence exercise, the writer was fortunate enough to make two operational flights in a Canberra B.1. It was by no means his first flight in a jet aircraft, but it was different and in many ways more impressive than previous ones.

In preparation, and to avoid troubles when airborne, I was "treated" in a decompression chamber—this after a visual ear-drum check by an R.A.F. medical officer. For a claustrophobe the small chamber to seat six would probably be very upsetting, but for the purposes of the test to 35,000ft I felt no adverse effects, though I needed to work hard on swallowing and yawning to keep my middle-ears clear during rapid descent. A certificate of decompression was duly issued.

For comfort and safety in the Canberra a mixed sort of kit is needed: it might comprise loose-fitting wool-lined flying-boots and thick socks; ordinary clothing except for a special string vest; shirt, open-necked, for oversea flight (this prevents one being choked by tie-and-collar shrinkage in the event of a ducking); flying overalls; pressure waistcoat; Mae West; and helmet and sun-goggles or glasses. Gloves do not seem to be necessary. Other safety equipment comprises parachute and dinghy packs, emergency oxygen supply and ejector seat. A point to remember is that when landing away one needs any ordinary clothing which has been shed in order to dress in flying kit. It is embarrassing (and sometimes not permitted) to appear in mess or dining-room in shirt-sleeves and flying-boots!

Before take-off in the Canberra, captains make a careful and systematic exterior check of the aircraft. The smallest dents or suggestion of dog-ears on cowlings may be serious on a high-speed aircraft. An unexpected item on the list is that of the Avons. A finger is inserted through the intake guide vanes and the compressor pushed round to check free-running. The intake vanes are then twisted by hand to full-fine for easy starting. As the vanes are linked together, one moves all.

The pilot cannot see his control surfaces from his seat, so a member of the ground crew is called in when the crew have embarked. First, the external rudder lock is fetched and given to the pilot at the controls. It is not previously removed in case the wind causes the rudder to hammer against its stops when no one is at the controls.

Starting-up by slow-burning cartridge is a very quick and simple procedure once the necessary switches and cocks are on. Acceleration to self-supporting speed takes only a few seconds and the two Avons seem to be idling in no time. Visual checks of the flaps and dive-brakes are next made, with ground-crew aid and pre-arranged signals.

So much for the preliminaries (met, navigation and signals briefing had all taken place earlier).

The Canberra can be taxied reasonably fast with safety, because the ground handling is good and the brakes are powerful. That is not to say that the brakes are not heavily taxed, as they are on every other jet aircraft. Some pilots use their Avons differentially to help manœuvring and so spare the brakes.

Pre-take-off checks are brief and mainly concerned with seeing that the Avons get their fuel at full power. There was a cross-wind which, while not bothering the aircraft, can upset the Avons while accelerating them from idling speed. For this reason we opened-up to something like half T.O. r.p.m. (which still only gives quite low thrust, for most of the power is developed in the last 1,000 r.p.m.) while facing into wind, and then rolled on to the runway and went straight off without any special attention to prior livening up. One of the last actions is to close the clear-vision porthole, which is left open for as long as possible to ventilate the cockpit. The feeling of acceleration was appreciable but not specially remarkable. As the nosewheels lifted off there was little apparent attitude change, and almost at once we were airborne, turning to port, and climbing with speed rapidly mounting to 200 kt. The noise from the Avons was quite small and remote and wind noise was also very slight.

The practice is to go rapidly up, first at a steady airspeed then at a pre-determined Mach number. As the air gets thinner the noise seems to get less. A good impression of both forward speed and speed of climb can be gained at first by the rapidity with which the Canberra bores up through the cloud layers and later leaves all cloud far below it.

On the rumble-seat beside the pilot I had just sufficient room to perch on a dinghy pack and look out without interfering with the pilot's elbow-movements. I was glad to have sunglasses, because the sun is particularly brilliant and the very fact of having nothing but bright distance to gaze at seems to put some strain on one's vision. Perhaps either the scarcity of focal points or the great distance apart of those which there are has the effect of over-exercising one's powers of accommodation.

One often hears that it is extremely difficult to see other aircraft at very high altitudes, and this I can certainly confirm; not only had I great difficulty in seeing another Canberra which I knew to be quite close to us, but having lost sight of it for a period of minutes, I suddenly found it reappearing as large as life and only a few hundred yards away at the front end of a momentary contrail. These contrails, according to circumstances, can be most valuable or otherwise. An aircraft can be plainly and immediately discerned at the head of one; without the trail it would take a prolonged, eye-tiring search to find.

Visibility at our own level towards high white cu-nim over

AIRBORNE IN A CANBERRA...

Denmark was probably as much as 200 miles. Upwards the heavens were like blue-black ink; down-sun the sky looked violet-blue, while into sun it was a paler-blue, less-clear atmosphere. Water was not easy to recognize below, because of the cloud shadow and because in shade it frequently gave back the spotted, dead, slate-coloured reflection of an antique mirror.

Having levelled out at about 42,000ft we settled down to a brief period of cruising at around 500 m.p.h. before starting on a long let-down. Within a few minutes of seeing the last of the English coastline through the cumulus clouds, we were able to see Holland and the Island of Texel ahead. The heat of the sun through the bubble canopy was considerable and beads of perspiration ran down our foreheads and around our masks. The proposed new lightweight sun-reflecting helmets will be welcome when they arrive. In contrast our feet and legs were no more than comfortably warm, while on the cockpit sides and canopy and door-frames frost glistened. Cockpit pressure altitude was around 25,000ft.

Complete calm reigns at 8 miles high, and thus the very occasional tremor of high-altitude turbulence is a matter for comment—always supposing that the sensation is not the onset of compressibility effects. This can be checked by the Mach meter.

At top altitude the Canberra remains unexpectedly manoeuvrable and responsive to controls. At night and into sun the pilot must fly frequently by instruments: this calls for great care and accuracy, for much the same reasons as it did on the Mossie, when loaded and high, in wartime. A small change in fore-and-aft attitude causes a quite disproportionate alteration in speed and height. By a different token, the high speed results in a big error in position if the course wanders for only a few seconds.

An indication of the speed of covering ground—or air—is given by our brief timetable. The route Bremen (take off), North Sea (well up towards Norway), Edinburgh, Glasgow, Barrow, Northern Ireland coast, Isle of Man, Manchester, Grimsby, seventeen miles N.E. out to sea and back to Binbrook took under 2½ hours.

To give an indication of noise, I may add that our navigator had trouble with his microphone. Until it was remedied, he was able from his table to shout instructions to the pilot in the cockpit in front. The pilot, of course, had his helmet and head-set on. Another example was given when a rubber oxygen-lead swung against the cockpit side. I could hear the tap quite plainly.

When the engine power was cut back to commence the descent I was a little surprised to see clearly the intake vanes of the starboard Avon alter pitch; much more surprising was the small globule of oil which sat trembling in the sunlight on the edge of a small vent on the cartridge-starter fairing. How it contrived to remain there with tons of air per second rushing past it, I cannot imagine.

On occasions during descent, the air-brakes were used, and without clawing the aircraft back they were most effective in preventing excess speed building up. At all times during the flight when changes of speed or attitude were made, the pilot used the variable-incidence tailplane with a flick backwards or forwards on the controlling switch.

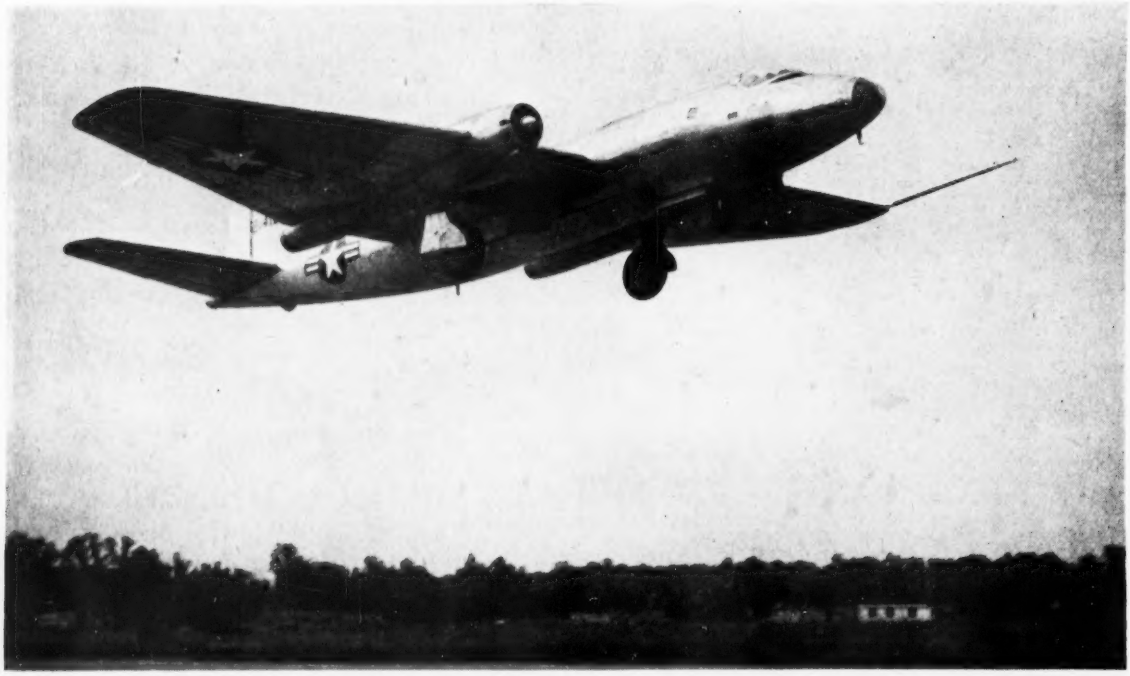
At one point on the flight I asked for the bomb-doors to be opened, remembering some depressing stories about the effect such an action might have on the Canberra. The answer is, I understand, that one early rogue prototype gave rise to the instability and buffeting stories. Certainly our machine made no fuss with doors open at operational speed, although, as with most aircraft, the air noise altered. As would be expected with the big increase in keel surface which the open doors give, the aircraft becomes more stable directionally, and this calls for more use of controls to effect a change of heading on a bombing run. The plotted results for Canberra squadron bombing practices from 20 to over 40,000ft indicate that while never so good that an improvement cannot be made, they already indicate a satisfactory standard both for visual and blind dropping.

Down at cloud level again the speed of the Canberra became apparent once more and the more turbulent air caused a few sharp bumps. On one approach and landing—to a German airfield—we made a visual approach, map-reading in and landing after a normal circuit. On the return to base we made a procedure let-down and straight-in approach.

So clean is the Canberra that without brakes it would roll on for thousands of yards in spite of its very moderate touch-down speed. The brakes, as mentioned above, are very powerful and some care must be used when applying them if damage to tyres and nosewheel is to be avoided.

The particular Canberra concerned in my flights has quite a history and is unique in being painted mostly in white. Behind this is a story of a remarkable flight to Australia at short notice, with the minimum of preparation and aids and with only standard tankage. The leg into Darwin was particularly dicey and great credit is due to the crew who took 999 to Woomera. Once there to help with calibration tests the aircraft in standard colours (whatever they are, could not easily be spotted visually and so it was painted white underneath and has stayed so ever since.

AND MEANWHILE, IN AMERICA . . .



The first Martin-built B-57—the U.S.A.F. night-intruder version of the Canberra—powered with two Wright J65 turbojets. The J65 is the American-built version of the Armstrong Siddeley Sapphire. It is to carry American bombing equipment, guns and sights.

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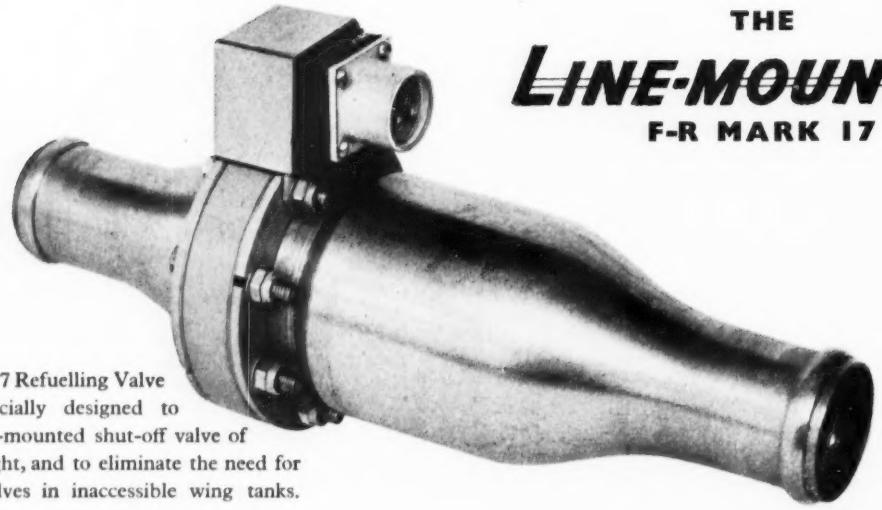

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ARE WE NEARER TO SPACE-FLIGHT?

Delegates to Fourth International Astronautical Congress Discuss the Problems

By ERIC BURGESS, F.R.A.S.

ROCKET experts, engineers and scientists meeting at Zurich for the Fourth International Astronautical Congress have shown that there are many fundamental difficulties which must limit man's aspirations towards space-flight.

At this congress, sponsored by the International Astronautical Federation, thirty papers were read during the technical sessions. They covered diverse subjects, ranging from problems in celestial mechanics to the possible uses of atomic energy for space-ship propulsion. It is possible to comment here on only the more important papers.

Generally it was shown that theoretical problems in celestial mechanics were soluble at the present time and that the process was greatly eased by modern electronic computing machines. Nevertheless, although the courses of space-ships could be accurately plotted in space, neither engineering design nor chemical technology were sufficiently far advanced to make the success of any interplanetary venture a reasonably certain eventuality.

In a paper by Milton W. Rosen (associated with the Viking rocket experiments) and Richard B. Snodgrass, both of the U.S. Naval Research Laboratory, it was pointed out that experience with high-altitude sounding rockets had proved disappointing so far as space-flight was concerned. Due to errors in adjustment and unpredictable variations in performance of these rockets, full theoretical capabilities are rarely achieved. Yet interplanetary flight by the use of chemical propellants calls for control within narrow limits of the final velocity of the rocket. Some of the limitations of chemical propellants were discussed by W. N. Neat (England), from whose paper it could be seen that without atomic energy the take-off masses of interplanetary rockets must be exceedingly great and that little reserves of propellant could be included to allow for errors.

As modern rockets may have a variation in performance which would call for additional propellant reserves exceeding the payload in an interplanetary mission, it was concluded by the N.R.L. scientists that there is not sufficient margin for error. The future development must be made in two ways; a reduction in the probable error and an increase in the margin.

Back to Earth

A paper by Prof. General G. A. Crocco (Italy) considered the best places and orbits for contacting space-ships in order to transfer additional material to them, i.e. for refuelling. Of most interest in his paper were conclusions concerning the descent of empty freighters. Two problems presented themselves, the optimum trajectory for a safe landing and that of the rise in temperature due to the high velocity of penetration of the atmosphere. By tracing the lines of optimum slope of descent and of constant temperature, Prof. Crocco arrived at the conclusion that at speeds above Mach 15 it would be necessary to have some means of artificial refrigeration for the descending tankers, whereas, if the velocity could be kept lower than the critical figure, descent would be safe with reliance only on natural cooling.

H. Langemeyer of Austria spoke on the problems of generating electric power in space. He was of the opinion that the power requirements in space-vehicle projects have always been under-estimated. These requirements could be quite considerable. Discounting machines of all kinds as being troublesome from the maintenance standpoint, especially if used in unmanned satellite vehicles, Langemeyer was in favour of using thermocouples heated either by nuclear energy or solar power. It would appear that solar power must be preferable in any small instrumented rocket where ionization from a nuclear power source would upset the instruments and weight requirements could not allow adequate shielding. Despite Langemeyer's claim to have developed an element developing twenty times the voltage of normally known thermocouples, it would appear that thermo-electric methods of power generation can be used only on fairly large satellites where, in any case, it may be more economical to use turbines. H. Preston Thomas has shown* that solar thermopile power stations can reasonably be expected to deliver power at overall specific masses of the order of 10 kg/kW compared with 2 kg/kW for turbines.

*"*Journal of the British Interplanetary Society*," *Vol.* 11, *No.* 4, *p.*188.

Dr. S. F. Singer (England) presented a paper concerning the minimum orbiting instrument-carrying rocket. This type of machine would be used to enter a circular orbit at the limits of the Earth's atmosphere. It could continue with the high-altitude research programme and would have the great advantage that the instruments would be beyond the atmosphere for at least several hours instead of the few minutes which are at present permissible with high-altitude rocket techniques. Many problems in solar physics and associated with primary cosmic radiation need for their complete investigation a greater time of stay outside the atmospheric absorbing layers.

To assume a specific impulse of 300 seconds gives an idea of the orders of magnitude involved: a three-step rocket for an orbital vehicle of this nature would have to weigh about 100 tons at take-off.

A desirable feature of any satellite or other high-altitude rocket vehicle is that of gathering and transmitting information. One interesting use—for military purposes, for example—would be observations of the earth's surface. Kurt R. Stehling, of Princeton University, suggested two possible methods. Assuming a restricted payload, he then proceded to find whether these methods would give the required results. The conclusions were disappointing. One system of observation which was discussed was an optical objective-lens image-converter system, while the other was a microwave radar scanner. For his analysis he assumed an orbit at 500 miles altitude which would give a circular velocity of some five miles per second. The target to be detected was taken as being about 600 yards in diameter. The two systems were compared and it was shown that the optical-video method would have the advantage in weight and resolving power but that its daylight dependence and atmospheric cloud attenuation limitations would be quite severe. They were bad enough to indicate questionable feasibility from the operational standpoint. On the other hand, the low resolving power of the radar unit from the 500-mile altitude, together with attenuation losses, limited that system's usefulness. Stehling concluded that, despite weight requirements of food, air and water, the substitution of a human observer for instruments might give a decided reduction in take-off weight. The difficulty is, of course, that arrangements must be made to bring the human observer back again! And return journeys always increase tremendously the take-off masses for interplanetary missions, driving them into fantastic figures.

Atomic Power

Several papers were concerned with atomic rockets, their working fluids and their cooling problems. One conclusion, by H. J. Kaeppeler (Germany) was that film-cooling could be developed to cool effectively the reaction chambers of atomic rockets which were using a working fluid heated by fissile material. Dr. Sänger (France) explained the advantages of a photon rocket and appeared optimistic concerning its ultimate development for use in space-ships when fusion reactions can be controlled.

The organization of the space-flight programme was also discussed in some detail. Cdr. R. C. Truax of the U.S. Navy suggested that it was important that popular support should be obtained and that other ways and means of raising finances for the interplanetary venture should be sought for in the coming years.

Dr. W. von Braun outlined his proposals for reducing the cost of a space-flight programme. He was of the opinion that a definite programme must be followed and that space-flight would not be a natural evolution from other work, such as that concerned with military rockets or rocket-propelled aircraft. By concentrating on a few types of rocket motors which could be employed in clusters in several different projects, both in aeronautics and high-altitude sounding, it would be possible to reduce considerably the cost of the programme. These motors in large clusters could then be employed for the various steps of a space vehicle.

In conclusion, the Fourth International Congress seems to have avoided the fanciful schemes for interplanetary projects which have tended to mar the technical sessions during previous years. The concensus of opinion appears to be that the way to space-flight is longer and steeper than many people would like to admit.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

S.E.5 Memories

THE splendid article on the S.E.5 by J. M. Bruce (July 17th) was nostalgically absorbing to me, as I not only flew these magnificent aeroplanes during the 14-18 War, but for many years thereafter, my last flight being logged as having taken place in August, 1931.

During those 15 or so years I flew well over 1,000 hours on the type—perhaps a record—and from 1922 entirely on Skywriting, the clever invention of my very old friend, the late Major Jack Savage, M.B.E. During the 12 very happy years I worked for him, I operated the S.E. over almost every country in Europe, Canada, Australia and for two years under United States skies, and during that long period of intensive flying I never had one real forced landing due to mechanical trouble, although there were the usual number of weather-dictated descents; neither do I remember ever seriously damaging any of the many S.E.s I flew, and, mark you, when abroad we usually operated from any old field, often chosen from the air, and one could not always guarantee to pick a smooth surface from above. This sort of operating in those days meant that we often had to use grades of petrol not best suited to the needs of the Wolseley Viper and, moreover, we frequently had to satisfy that engine's oil demands by purchasing medicinal pure castor oil from the nearest local chemist, often at exorbitant cost and with the obvious facetious remarks! Nevertheless, in 18 months' operating in America we earned 1½ million dollars, at least 50 per cent of which was remitted to this country; there was a dollar shortage even in those days!

The fact that the S.E. performed so airworthily under those conditions and for so many years is yet more convincing proof of the genius of Sir Geoffrey de Havilland and Harry Folland, of the first-class production methods of the many firms engaged in manufacture, and not least of the work of those like your correspondent George Cook, who, for the five years he was with Savage, was in charge of engine maintenance. I can confirm his statement that Jack Savage never flew an S.E.; he could scarcely get into the cockpit—too much adipose tissue! The late "Mac" Graham was the airframe expert, and what an expert he was! He was our chief inspector here at Heston until his death two or three years ago.

Jack Savage was very proud of a framed letter in his office from the late and ever-lamented Sir Sefton Brancker, dated 1923, to the effect that at that time Savage was the largest (*sic*) owner and operator of civil aircraft in the British Empire; and if my memory serves me his fleet of S.E.s then numbered 35, all of them in active commission.

I feel I must mention the name of Mr. Robert J. Coley, for without his help I doubt whether there would ever have been any Skywriting, as he alone was responsible for providing all the "bits and pieces," including engines, airscrews, etc., which went into the making of the 40 or 50 S.E.s finally commissioned by Major Savage.

Of the 12 Skywriting pilots employed by Major Savage at his busiest period, eight unfortunately have departed this life, but only one through the medium of the S.E. and that through an error of judgment during a landing in Tennessee, and I append here the names of all those grand fellows: G. F. Bradley, D. A. Shepperson, C. R. McMullin, E. D. C. Herne, Sydney St. Barbe, Charles Collyer (American), Martin Rudolph (German), W. von Feilitzsch (German).

Four remain, namely, L. R. Tait Cox, with the Plessey Co.; M. L. Bramson, of whose present whereabouts I am unaware; my very old friend Cyril Turner, the original Skywriting pilot (and now managing director of Irving Airchute); and, of course,

Heston, Middlesex. G. A. LINGHAM.

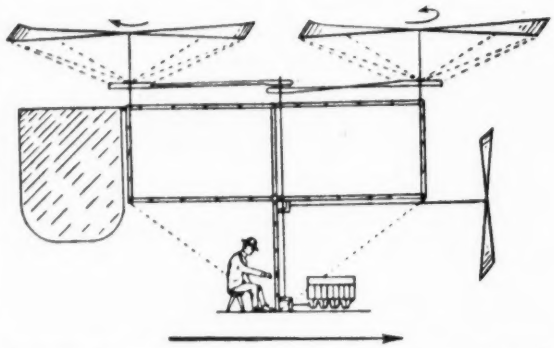
[Commenting on a previous letter in which a correspondent questioned a ceiling of 23,000 for the S.E., J. M. Bruce writes to say that this altitude was attained during Martlesham tests; it is possible, he remarks, that the aircraft carried no armament or ammunition.—Ed.]

On the Job

WHILE I thoroughly sympathize with "Ex P.R. Mosquito Pilot" in deploring the lack of Mosquitoes at the Royal Air Force Review, I must point out that they were not entirely unrepresented. A P.R. Mossie was to be seen having the time of its not-so-young life, presumably photographing Odiham and environs.

While such modern monsters as Swifts, Venoms, Valettas, Meteors, Vampires and Lancasters (*sic*) were very pretty, may I point out that this Mossie was the only aircraft present actually doing the job for which it was designed!

London, W.1. FINALS ON ONE.



The Santos-Dumont twin-rotor helicopter project of 1906. Overall length was quoted as 41ft and height as 49ft 6in. A 24 h.p. Levavasseur engine —weighing 77 lb—was specified.

A Very Early Helicopter Design

THE following may be of some interest to you in view of the rapid development of the helicopter type of aircraft today. I have been a reader of your associated journal, *The Autocar*, for very many years, first reading it as a boy about 1903! Round about 1908-1909, I clearly call to mind seeing illustrated a machine which consisted of a frame with two screws in the helicopter position, with no other means of support—a true helicopter, not a "gyroplane." I think that the design was attributed to M. Santos-Dumont, but am not certain of this.

It occurs to me that it might be very interesting to look up this reference to a pioneer helicopter design of 45 years ago.

Regarding pioneer jet planes, might I refer to the famous competition for model aircraft (of the heavier-than-air type) which took place at the Alexandra Palace about 1907 or 1908, in which A. V. Roe, then a young marine-engineer, was so successful? One of the competitors used a rocket to start off and propel his model glider. This would seem to have been the first jet-propelled aeroplane.

London, N.17. W. ADAM WOODWARD.

[Congratulations to our correspondent on a good memory. The illustration, reproduced above, actually appeared in *The Autocar* of January 13th, 1906. As he says, the design was attributed to Santos-Dumont.]

Airline Pilot Shortage

MAY I voice an opinion on the reason for the shortage of senior civil airline pilots, recently the subject of much discussion? In spite of the article by I. L. S. McNichol (*Flight*, July 3rd, 1953) advocating the need for a Government-sponsored scheme for specific airline pilot training, the source of recruitment for civil pilots will, of necessity, come from the fighting Services for some time.

Contrary to Mr. McNichol's beliefs, such pilots entering the profession are far from "overspill" or even rejects from the Services. The peacetime personnel establishment is laid down, and those with the keenness to continue flying, and who are not granted permanent commissions, may very well turn their interests to commercial aviation. Since the desire to continue flying remains, the pilot material entering the profession is usually of the highest order.

But the aircrew member seeking this new career will find himself confronted with a barrier of academic qualifications to surmount before he can be granted the necessary licences. The examination for the airline Transport Pilots' Licence, for instance, as far as the technical examination is concerned, consists of seven written subjects to be passed with an overall mark of 70 per cent. The basis of the subjects is, of course, necessary. But a glance at the syllabus, and more especially some passed examination papers, will reveal an enormous amount of material— I would put it at more than half—to be completely unnecessary. In fact, the material is only taught to specialist navigators in the R.A.F. and then only after some years of qualification in their category. To the potential civil airline pilot, this means months of concentrated study into the complicated theories of magnetism, advanced mathematical-scale problems and advanced physics.

The R.A.F.'s equivalent to the airline captain, the Transport

Command pilot, is spared the frightening academic knowledge; instead, the accent is put on operational factors and limitations of his aircraft and engines. A certain amount of academic knowledge is, of course, also required of him, and weaknesses are revealed by frequent examinations—the result of which may mean withdrawal from certain types of flying. Not so the airline pilot. His academic knowledge was probably higher than the Serviceman's at first; but once he has achieved his academic pass, he need never undergo further examinations. I sincerely believe that this severe technical academic examination necessary for the grant of the licence has been a dominating factor for some time past in limiting to a trickle the entry of the senior civil airline pilot into the profession.

The Ministry of Civil Aviation and Transport, and I.C.A.O., have laid down these standards, but the question remains whether such a high academic knowledge is necessary for the civil pilot and, if so, whether it is sufficient evidence to justify entrusting him with an aircraft-load of live cargo. The Transport Command pilot's task is in every way similar to the airline pilot. Apart from his frequent written examinations, periodical flying tests are also undergone. Continuation training of this sort for the civil pilot must, of financial necessity, be extremely limited. For this reason alone, I would place the Service pilot's capabilities above those of the airline pilot.

Examination of the causes of fatal accidents in commercial aviation can frequently be traced to errors of judgement on the part of the pilot. The comparative fewness of such accidents in Transport Command may or may not be the result of the foregoing reasoning. Nevertheless, it provides food for some considerable thought on the subject of academic qualification *v.* professional ability.

Hullavington, Wilts. L. H. LEVENE, F/O.

IN BRIEF

Mr. C. Rupert Moore, A.R.C.A., the aeronautical artist, is painting a picture of the attack on the *Bismarck* on May 24th, 1941, by Swordfish aircraft from H.M.S. *Victorious*, led by Lt. Cdr. Esmonde. In search of complete veracity, he wonders whether any reader can tell him the serial number—painted 5ft aft of the roundel—of the leader's aircraft; he has, apparently, been unsuccessful in his attempts to obtain the required information from any official source. Mr. Moore's address is "Tykesditch," Oakridge Avenue, Radlett, Herts.

THE AERONAUTICAL BOOKSHELF

"Pioneering in Aeronautics." Published by the Board of Award of the Daniel Guggenheim Medal, 29 West 39th Street, New York, U.S.A. Illustrated. $1 (paper covers) or $2 (cloth).

ONE of aviation's proudest honours is the Daniel Guggenheim Gold Medal, awarded annually since 1929 to persons who have made outstanding contributions to the advancement of aeronautics, irrespective of race, colour, nationality or sex. This book contains portraits and short biographies of all 24 recipients of the Medal, starting appropriately with Orville Wright in 1929 and ending equally appropriately with Sir Geoffrey de Havilland in 1952.

The roll includes 16 Americans, four Britons, two Germans, a Spaniard and a Russian-born engineer who is now a naturalized American. In most cases their biographies tell of achievements in basic research or engineering genius that have speeded development of the fixed-wing aeroplane from Orville Wright's frail stick-and-string biplane to Sir Geoffrey de Havilland's sleek Comet. But the honours list includes also pioneers of lighter-than-air and rotating-wing flight.

Some of their stories seem incredible even in an age when we are accustomed to newspaper boys growing up into millionaires. Take, for example, the case of a young factory-hand named Larry Bell. One day in 1914 the superintendent of the shop in which he worked walked out; so Bell suggested to his boss, Glenn L. Martin, that he should be made superintendent and that the company should hire an engineer. This was done. The engineer's name was Donald Douglas, and from those humble beginnings have grown three of the world's great aircraft companies.

It is a pity that the biographies of the British Medallists are so brief and colourless, for their stories could easily have provided as rich a source of historical reference and interest as the others. Even more, one must regret the few errors that ought to be avoidable in a book of this nature. The Douglas Skystreak is referred to as a Navy fighter. Lester Gardner is said to have crossed the Atlantic in the Zeppelin Hindenburg in 1939—yet one reads on another page of this airship's destruction in 1937. There are other equally silly mistakes, but not enough to prevent these stories from being an inspiration to the Whittles, Boeings and Doolittles of tomorrow.

"Flying the Atlantic," by Manfred Reiss. Max Parrish and Co. Ltd., Adprint House, Rathbone Place, London, W.1. Fully illustrated 6s (boards) or 7s 6d (cloth).

THIS is one of a series of picture books that have been adopted officially as education aids for children. At first glance, the unusually bold use of colour and design gives it the appearance of an airline travel brochure painted by Picasso.

It is only when one begins to study the stark white skeleton structure of a Stratocruiser, set on a black background, that one sees how skilfully Mr. Reiss has combined the accomplished artist's sense of colour and feeling for drama with the engineer's insistence on precision. Only after reading also the splendidly-written text does it become apparent why *Flying the Atlantic* is able to teach a youngster more about how aeroplanes work and how airlines operate, more quickly and more effectively than half a dozen ordinary books.

This is, in fact, the sort of book that fathers buy for Junior and then put away in a safe place until they have finished with it themselves.

"Newfoundland Air Mails, 1919-1939," by R. E. R. Dalwick and C. H. C. Harmer. H. R. Harmer Ltd., 41 New Bond Street, London, W.1. Price 15s.

FOR the specialist in air-mail stamps this well-produced book contains a good deal of hitherto unpublished information about special stamps issued for transatlantic flights. In addition the notes on the flights themselves are of general interest to those in aviation. The 176 pages are well provided not only with illustrations of covers and individual stamps, but also with photographs of such subjects as the aircraft and crews concerned.

OTHER BOOKS RECEIVED

Servicing Guide to British Motor Vehicles (Vol. 2), by J. N. McHattie. Trader Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1. Price 42s.

Now on sale is a revised edition of John W. R. Taylor's popular *A.B.C. of Civil Aircraft Markings*, published by Ian Allan, Ltd. (Craven House, Hampton Court, Middlesex), at 2s 6d. The book contains the complete alphabetical register of British civil aircraft and a list of the registrations of foreign airliners likely to be seen in this country. As in previous editions, the lists are supplemented by photographs of excellent quality, all of which are new to the series.

The Flying Omnibus, edited by Paul Jensen. Cassell and Co., Ltd., 37/38 St. Andrew's Hill, London, E.C.4. Price 15s. A collection of stories about the air, this entertaining omnibus includes contributions from such well-known people as Pierre Clostermann, Paul Brickhill, H. E. Bates and James Thurber. Grouped in five parts, the scope ranges from an Edgar Allan Poe tale, published in 1844, about an imaginary crossing of the Atlantic in a balloon, to a futuristic space-ship story.

FORTHCOMING EVENTS

Aug. 29. Vintage Aeroplane Club: Rally, White Waltham.
Aug. 30. Aero-club d'Italia: Pescara Rally.
Sept. 3-5. Chester Searchlight Tattoo (R.A.F. Night, Sept. 4).
Sept. 3-10. Aéro-Club de Cannes: Cannes Grand Prix.
Sept. 6. S.M.A.E.: "Yorkshire Evening News" Model Flying Festival, Sherburn-in-Elmet.
Sept. 7. S.B.A.C. Farnborough Display and Exhibition: Technicians' Day.
Sept. 8-10. S.B.A.C. Farnborough Display and Exhibition: Private Invitation Days.
Sept. 11-13. S.B.A.C. Farnborough Display and Exhibition: Public Days (Public premiere, Friday, 11th).
Sept. 11. Helicopter Association of Great Britain: Annual Dinner.
Sept. 12. "At Home," R.N. Air Station Eglinton.
Sept. 13. Saar Aero Club: International Balloon Rally.
Sept. 14. R.Ae.S. Wilbur Wright Memorial Lecture: "Structures," by Prof. N. J. Hoff, F.R.Ae.S., F.I.Ae.S.
Sept. 14-17. R.Ae.S. and I.Ae.S.: Anglo-American Aeronautical Conference.
Sept. 15. Battle of Britain Day.
Sept. 19. "At Home," R.N. Air Station Abbotsinch.
Sept. 19. R.A.F. At-Home Day.
Sept. 20. St. Albans Model Aero Club: All-Britain Rally, Radlett.
Sept. 20. Aero Club de Milan: Milan Grand Prix.
Sept. 23-24. Aerodrome Owners' Association: Annual Conference, Newcastle-upon-Tyne.
Sept. 24. City of Coventry Freemen's Guild: Lecture "Development of Armstrong Siddeley Gas-turbine Engines," by W. H. Lindsey, M.A., F.R.Ae.S.
Oct. 8. Start of England-Christchurch (N.Z.) Air Race.
Dec. 17. Anniversary of the Wright Brothers' First Flight.

THE INDUSTRY

Titanium—at 1,500 Tons a Year

AS a private venture, Imperial Chemical Industries are to build a plant to produce sponge titanium for conversion into titanium ingots at the rate of 1,500 tons a year. Production is scheduled to begin in two years' time.

The cost of the new plant is to be borne entirely by I.C.I., but the Ministry of Materials has contracted to buy up to three-quarters of the output over the first four years if the metal is not otherwise sold in various forms for use by Government contractors. The Ministry also has an option on the full output, should it be needed for defence purposes. The price paid will be equivalent to the world price current at the time of purchase. Pilot titanium-producing plants, now under construction and distinct from the above-mentioned plant, will produce 150 tons of sponge titanium a year, starting next year.

In their annual report this year I.C.I. announced that a new method of producing titanium which was being developed in their laboratories was giving encouraging results. It seems probable that, since the large new plant is now projected and Government backing given, this new method will be employed. The fact that no similar information has been released in the United States or Canada—the other two countries producing the metal—suggests the possibility that I.C.I. have now gained a lead in titanium production methods.

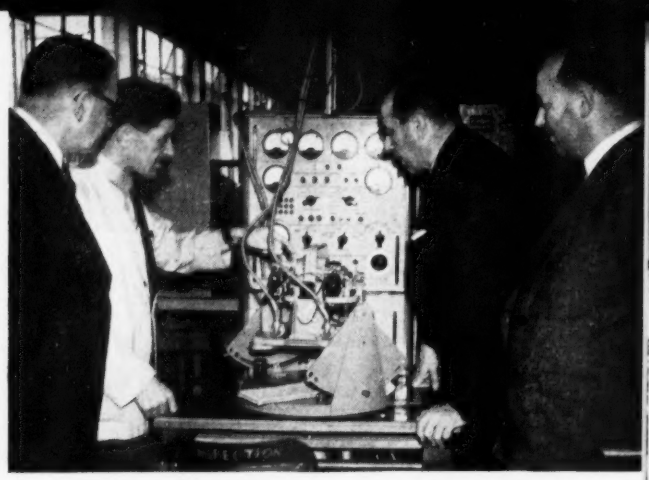
A study of the aeronautical possibilities of titanium appeared in *Flight* on June 27th, 1952, and a digest of an R.Ae.S. paper on the subject, read by Maj. Teed of Vickers-Armstrongs, Ltd., was given in our pages on February 6th, 1953.

Secret Service

AN entirely new type of service for the aircraft industry is offered by the 20th Century Joinery and Packing Co., of Queen's Drive, Thames Ditton, Surrey, who specialize in the pre-packing of aircraft and component parts.

For security reasons it is often essential to pack such products in the factory where they are made. So, following the lead of American firms, 20th Century have fitted out a three-ton Bedford Luton van as a mobile packing station, complete with portable saws, thermal sealing-machines and all other equipment necessary to provide a complete packing service. The staff who man the vehicle, it is stated, are all security-vetted.

Only a small percentage of the work being done at present for leading companies in the industry is secret; and to cope with its fast-growing volume of other business, 20th Century will move early in September to new premises at Hampton Court, where they will have their own rail siding facilities. That is only a start, for all senior executives are ex-aircraft industry and Fleet Air Arm people, and their aim eventually is to operate their own freight-carrying aircraft to deliver urgently needed cargoes after packing. The company has applied for associate membership of the S.B.A.C.



SEEING HOW: Sir James Helmore, K.C.M.G., Permanent Secretary, Ministry of Supply, recently visited the Cheltenham works of Smiths Aircraft Instruments, Ltd., accompanied by Mr. S. F. Follett, M.o.S. Director of Instrument Research and Development. He is here seen closely watching an autopilot on test. On the left is Mr. Follett and on the right is Mr. Watson (works manager).

Laminated Nimonic/Copper Sheet

FOR many years past the high-strength, high-temperature alloy developed under the name of Nimonic 75 has been widely used in sheet form for the combustion-chamber linings in many British gas turbines. In this type of service the chief requirements of the metal are strength to resist distortion and cracking through the stresses arising from thermal expansion, plus high resistance to scaling. Nimonic 75, it is stated, fulfils these needs to an adequate degree and, in addition, readily lends itself to normal fabricating including argon-arc and resistance welding.

For some time, work has been going on to develop a material which would have the characteristic properties of Nimonic 75 but, at the same time, would have a much higher conductivity in order to dissipate the heat of the combustion in the chamber more quickly and secure much more even temperature-distribution. Under the registered trademark "Nimoply 75," Henry Wiggin and Co., Ltd., of Birmingham, now announce the introduction of composite metal sheets in which Nimonic 75 is used on both sides of a copper base.

This metal sandwich is produced by rolling copper between sheets of Nimonic 75; the result is a clad sheet having many potential uses, not only in gas turbine construction but also in other fields of high-temperature engineering.

IN BRIEF

A new leaflet (No. B.H.28) from Hellermann, Ltd., Tinsley Lane, Crawley, Sussex, describes and illustrates their binding system for electric cable-ends. Various types of sleeves and/or markers can be attached with the aid of a simple tool.

* * *

Shareholders attending the annual meeting of Oldham and Son, Ltd., held yesterday, were invited by Mr. John Oldham, O.B.E., J.P. (chairman), to inspect the company's new department for the manufacture of Fibrak battery separators.

* * *

Jenolite, Ltd., 43 Piazza Chambers, Covent Garden, London, W.C.2, have added a new preparation to their range of chemical degreasants—an emulsion-type degreaser, which may be used either in concentrated form or in warm water dilutions. Non-inflammable, it is claimed to be an excellent degreasant for all metal surfaces on which no chemical attack can be tolerated.

DIRECTORSHIP: Sangamo Weston, Ltd., the instrument specialists, announce the appointment of Mr. H. A. Springer, A.M.I.E.E., to their Board. Horace Springer joined the company in 1932 and, after holding posts in the production and contracts department, was appointed contracts manager a year ago.

Northern Aluminium Co., Ltd., announce that as from August 24th the address of their Newcastle area sales office is Groat House, Collingwood Street, Newcastle-upon-Tyne 1. (Telephone: Newcastle 20878/9; telegrams: Noraluco Newcastle-upon-Tyne.)

* * *

A feature of the Australian Jindivik pilotless target is its rocket-propelled take-off trolley. Dunlop have supplied the wheels for this trolley, and the automatic brakes which bring it to a halt as soon as the aircraft becomes airborne. They have also provided the pneumatic shock-absorbing system for the Jindivik's skids.

* * *

The British Tyre and Rubber Co., Ltd., announce the appointment of Mr. W. Bowden as group chemist, Mr. W. Glover succeeding him as works chemist at the company's Leyland factory; Mr. C. H. Holyoak becomes group works accountant; and Mr. H. Ackers is appointed deputy works superintendent at Leyland.

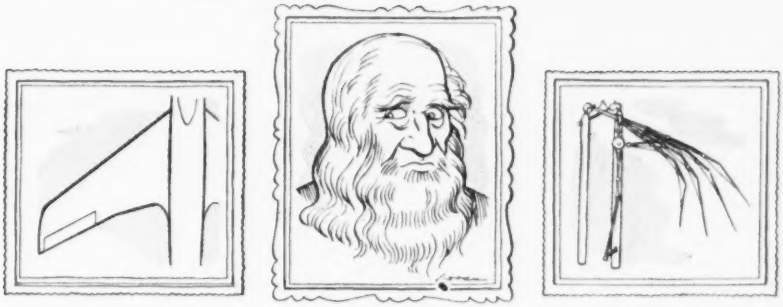
* * *

Civilian and Air Force radar specialists from Holland and Sweden are attending a three months' course of instruction, at the Highbury, London, works of Cossor Radar, Ltd., in the maintenance and use of surveillance radar. The company is at present supplying equipment to these two countries.

* * *

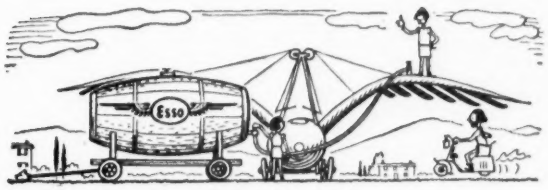
The British Standards Institution is now installed in its new premises at 2, Park Street, London, W.1 (Mayfair 9000). The new building will contribute to more efficient working by concentrating the B.S.I.'s scattered departments under one roof, and it will also provide increased and more convenient accommodation for the 13,000 specialists who attend the 3,500 committee meetings held during the course of each year.

ESSO at the S.B.A.C. Show



Leonardo in the Lab.

IN this age of specialisation, individual genius seldom expresses itself through more than one channel of human activity. The great man of Science is seldom more than a dabbler in the Arts, the distinguished poet is usually a mug in matters of mechanics, and the



brilliant engineer may be tone-deaf, colour-blind and tongue-tied. There are, of course, exceptions. There is, for example, a certain famous modern statesman who is also a talented writer, military strategist, historian, orator and humorist, a more-than-useful painter and a competent bricklayer.

But the twentieth century is no more likely than the sixteenth, seventeenth, eighteenth and nineteenth to produce such a versatile genius as Leonardo da Vinci.

Leonardo's entry in WHO'S WHO would make bright reading . . . painter, sculptor, architect, astronomer, engineer, scientist, poet, musician, inventor, and so on. He painted the "Mona Lisa" and he devised a system of hydraulic irrigation for the plains of Lombardy. He wrote a classic, TRATTATO DELLA PITTURA, and he designed the first flying machine. He produced designs for anything and everything, and if he were alive today he would no doubt (in his spare time) design superb fuels and lubricants for modern aircraft.

Lacking a Leonardo, Esso employ specialist designers of fuels and lubricants, a whole flock of them, and oddly enough they all seem to wear the inscrutable smile of Leonardo's masterpiece.

Aircraft designers do not evolve new structures and *hope* that fluids to match will be available: their new patterns in metal are devised with specific fuels, oils and lubricants in mind. So two sets of designers work together, hand-in-glove—from scratch. The designers of form and the designers of fluids. Esso engineers and scientists are therefore " in " on new designs as soon as they are hatched, for with their unequalled experience and know-how they can usually point out possible snags long before they become apparent and costly.

There will be Esso representatives at the S.B.A.C. Show at Farnborough (look for the inscrutable smiles!) and they will be ready and eager to meet anyone with a problem in fuelling or lubrication, and incidentally they'll talk their heads off about such matters as Esso Aviation Turbo Oil 35 (E.E.L.3), E.E.L.4.A, E.E.L.6, W.S.2211.

The Esso Stand is 215.

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CIVIL AVIATION

K.L.M. CONTENDER in the forthcoming London-Christchurch race is Douglas DC-6A "Dr. M. H. Damme," registered PH-TGA. Although designed as a freighter it will, as reported below, carry 65 passengers plus a large crew. The entry recalls the Dutch airlines second place (with a DC-2) in the 1936 England-Australia race.

PRINCESS PROGRESS

COMPARATIVELY little has been heard of the Saunders-Roe Princess since the first of the three great flying boats (the other two are now laid-up) made her maiden flight a year ago, although she has often been observed by spotters in points as far apart as Pembroke Dock, Cherbourg, Plymouth and the Channel Islands. However, a note on the progress of flight trials, resumed in March on completion of resonance tests and re-engining, appears in the maker's house journal; we reproduce the following extracts: "Having proved [the aircraft's control and stability characteristics] to be excellent, we were ready to make various performance measurements . . . although the present de-rated engines give only some 80 per cent of the power anticipated in the design stage, we have still been able to take-off at an a.u.w. of 320,000 lb. This is 5,000 lb greater than the original designed operational weight. . . . Part of the Princess's aft top deck has now been comfortably furnished, and this provides a welcome 'rest room' for crew members during off-duty spells. . . . The Princess is now on the slipway and two special strain-gauged propellers are being fitted for tests to measure strain distribution in the blades during all flight conditions. When these tests have been completed, it is hoped that a full C. of A. will be just around the corner; and it will then be possible to commence the main programme of trials for the full C. of A." The journal adds that the Princess will, all being well, make more than one appearance at this year's S.B.A.C. Show.

ONE COMET WEEKLY TO TOKYO

IT is learned that the recent reduction of frequency on B.O.A.C.'s Comet route to Tokyo (from twice to once weekly) was planned some time ago to meet increased training commitments with these aircraft. B.O.A.C. are not only preparing for the introduction of the Series 2 Comets, but are also training South African crews preparatory to the opening of the S.A.A. services with Series 1s on the Springbok route. An announcement from Tokyo, quoted in *Flight*, originally attributed the withdrawal of one of the weekly Comet services to a decline in traffic.

ROTOR-POST: Special covers, as illustrated, were designed for mail carried on the inaugural flights of Sabena's new international helicopter network. Freight and mail only are flown at present but, as described overleaf, passengers also will soon be able to fly in the company's S-55s.

K.L.M. RACE ENTRY

NO fewer than 65 passengers—50 of them Dutch immigrants flying to New Zealand—and a crew of 12 will be carried in the Douglas DC-6A entered by K.L.M. in October's London-Christchurch Air Race. Commander of the aircraft will be Captain H. A. A. Kooper, a portrait of whom appeared in our issue of July 24th. His first officer is Mr. J. F. Griffith.

Other members of the flight crew are P. J. Aarts (second officer), J. I. Noomen (third officer), H. van der Ham (first flight engineer), W. F. J. Tielman (second flight engineer), J. M. C. Kiepe (first radio officer) and J. van der Bos (second radio officer).

PANAIR'S COMETS

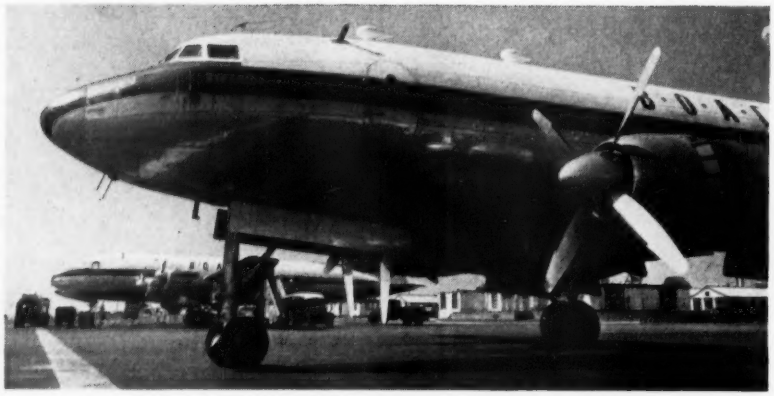
SEPTEMBER 1954 has been given as the probable starting-date for the Panair do Brasil Comet service between Europe and South America. The company's president, S. Paulo Sampaio, made this announcement last week, adding that the jet airliners would reduce flight time for the 7,250 mile journey from Buenos Aires to London by about half—to 17 hr 15 min. Panair signed an order for four Comet 2s earlier this year, delivery of which will begin in 1954 and also hold an option on two Series 3 Comets. The first production Comet 2, incidentally one of the 12 ordered for B.O.A.C., has now come off the assembly line at Hatfield and at the time of going to press the first flight was imminent.

CONSTELLATIONS STILL SELLING

DESPITE British progress in marketing new types of commercial aircraft at home and abroad, the industry is still a good way from overtaking America's long-founded lead in this field. There are ample statistics to support this view—such as those announced recently by the sales manager of the Lockheed Aircraft Corporation, Mr. L. Schwarts, who announced that Super Constellations worth nearly $150m (over £53m) had been ordered from the company by the end of June. He claimed that deliveries of aircraft abroad for the second half of 1953 would be 40 per cent greater than the combined export of large aircraft by all U.S. manufacturers during 1952. During the first six months of this year, Lockheed received orders for 21 Super Constellations from five different airlines—and Lockheed already held a back-log for 70 aircraft of this type at the end of 1952. Mr. Schwartz confirmed that Super Constellations had been ordered for the projected German airline.

NON-SKEDS UNDER FIRE

A RECOMMENDATION of the Senate Select Committee on Small Business that some "non-skeds" should be permitted a greater field of operation has evoked protests from a number of larger airlines. Mr. W. A. Patterson, president of United Air Lines, declared flatly that some of the irregular airlines were in business "only because of their deliberate, wilful and continuing violation of the law." He continued: "The committee asks that four or five irregular carriers . . . be certified without meeting the test of public convenience and necessity which the law requires and which the certified carriers have met." The Eastern Air Lines' president, Capt. Rickenbacker, commented that the recommendations, if adopted, would hand over to the irregular airlines "the very lifeblood traffic which the nation's trunk airlines have painfully developed in nearly a quarter of a century of pioneering to reach a subsidy-free status." Another critic of the committee's recommendation is Senator Edwin Johnson, who has claimed that the accident rate of the irregular airlines compares badly that of the regular companies, which he ascribes in part to the "shameful failure of the Civil Aeronautics Administration to enforce adequate safety standards." According to Senator Johnson, the "non-sked" fatality rate per 100m passenger miles was 7.9 over the period 1948-1952—seven times that of the certificated domestic and international carriers.



FLEET REORGANIZATION: The number of types in service with B.O.A.C. will be reduced from six to five in October, when Argonauts take over the remaining Hermes services—between London and East Africa. Examples of both are shown in this recent picture at London Airport, with the Hermes in the foreground. "Flight" photograph

CIVIL AVIATION . . .

SABENA HELICOPTER ROUTES

FOLLOWING a successful start with mail-only services by Sikorsky S-55s, Sabena will inaugurate regular passenger flights with these helicopters on September 1st. Services will be operated daily (except on Sundays) on the following routes: Brussels - Antwerp - Rotterdam; Brussels - Liège - Maestricht; Brussels-Lille. On the same day the airline will also inaugurate a helicopter mail service to Cologne and Bonn *via* Liège and Maestricht; this will be opened to passengers on September 14th.

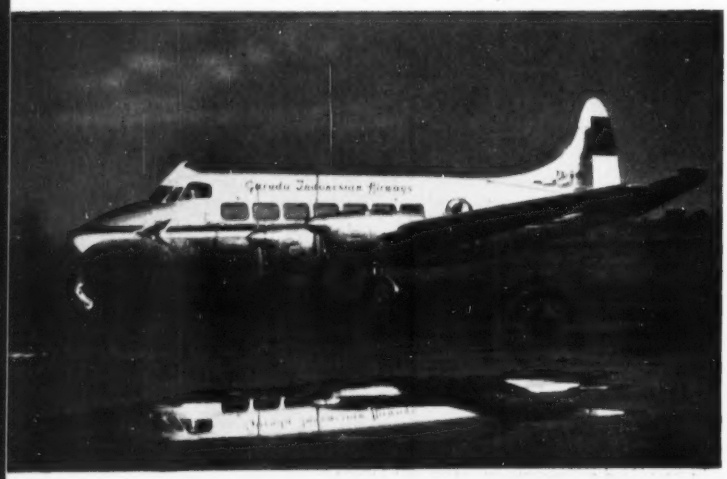
Heliports have been specially constructed in all but one of the city-centres served by the S-55s. That for Brussels is about 500 yd from the North Station, and the Rotterdam site is right in the heart of the city. The Liège and Maestricht heliports are on the bank of the Meuse. Lille chose the Place des Buisses, next to the railway station, as the landing-place. No site has yet been marked out at Antwerp, and the airport at Deurne is being used for the time being. Most of the services stop at Melsbroek, Brussels' airport, to provide a connection for passengers arriving or departing on a long-distance service.

AIR-TRANSPORT CONFERENCE IN ITALY

REPRESENTATIVES of the Italian and French air transport industries are to meet in conference at Florence on September 26th. At the meeting, which will last two days, they will discuss air transport affairs of interest to both countries. This conference, the first of its kind, has been organized by the Italian Centre for the Development of Air Transport (C.S.T.A.), a specialized association among the Chambers of Commerce in Italy; its aims are to further the progress of Italian air transport.

Lectures at the meeting will include one on air transport economics by M. Henry Bouché, founder and director general of the Institut Français du Transport Aérien (I.F.T.A.). M. Bouché is the French representative on I.C.A.O.'s council. In addition, Professor Giovanni Casiraghi, one of Italy's foremost designers of civil and military aircraft, will lecture on "The Technical Evolution of Air Transport." Representatives of three leading societies in Italy and France will attend. The organizations include the Associazione Italiana di Aerotecnica, the Association Française des Ingénieurs et Techniciens Aéronautiques and I.F.T.A.

FOR EXPORT: About 50 de Havilland Herons have now been ordered by overseas operators, all of whom have so far chosen the Series 1 with fixed undercarriage. This Heron, to be exhibited in the static park at Farnborough, is the first of 14 for Garuda Indonesian Airways.



AERODROME OWNERS' CONFERENCE

NEWCASTLE-ON-TYNE is the venue for this year's annual conference of the Aerodrome Owners' Association, which lasts from September 23rd—24th. On the Wednesday there will be a reception at Woolsington Airport, followed by a luncheon at the Town Hall.

INDIANS TRAIN IN BRITAIN

THREE members of India's Civil Aviation Department have arrived in this country for nine months' training under the Colombo Plan. Surprisingly, the Treasury announcement reporting their arrival states that they travelled by sea. Mr. A. M. N. Sastry will study piston and turbine engines with B.O.A.C., Bristol and de Havilland before returning as an inspector at the Hindustan Aircraft, Ltd., factory. Mr. A. V. Vartak, a senior aircraft inspector, will study with these companies and also with the A.I.D., A.R.B., B.E.A. and Armstrong-Siddeley. Another senior inspector, Mr. R. Prasada, will spend his time with the M.o.S., de Havilland, Vickers-Armstrongs, Armstrong-Whitworth, Avro and Smiths Aircraft Instruments.

BREVITIES

ANOTHER B.O.A.C. tourist service will begin early in October—a weekly return flight from London to Tripoli, Kano, Accra and Lagos. It will be operated by 54-seat Argonauts.

* * *

A representative of Hunting Air Transport said in Glasgow recently that his company hope next spring to connect Glasgow with the present services from Newcastle to Paris, Amsterdam and Hamburg, and to introduce services from Glasgow to Scandinavia. Mr. G. Reynolds-Payne has been appointed as Hunting's Scottish representative, with headquarters at 5, St. Vincent Place, Glasgow.

* * *

B.A.O.C.'s North American manager for the past four years, Mr. J. Ross Stainton, is to be transferred to London as general sales manager. He will be succeeded by Mr. W. Bray.

* * *

The Air Registration Board announce the issue of *Notice to Licensed Aircraft Engineers and to Owners of Civil Aircraft No.* 42, *Issue* 1 (dealing with tailplane attachments in Taylorcraft Plus D and in Auster 3, 4 and 5 variants).

* * *

At the request of I.C.A.O., the M.C.A. have released Mr. David Livingston, aerodrome manager at Northolt, for advisory duties in connection with the development of Beirut International Airport. He takes up the appointment in October. After service with the R.A.F. as a squadron leader, Mr. Livingston joined the M.C.A. in 1945—originally as assistant manager at Northolt.

* * *

A conference, to be attended by competitors and race officials only, will be held in the race briefing room at L.A.P. at 3.15 p.m. each day from Monday, October 5th to Wednesday, October 7th inclusive. Test flights may be made by competing aircraft between October 3rd and 7th with the signed permission of the stewards and the airport controller, provided the aircraft does not land away from the airport.

GERMAN TERMINAL: The Rhine is glimpsed in the top right-hand corner of this new aerial view of Dusseldorf Airport, which is just over four miles from the city centre. On the apron are three of the types regularly seen at this important traffic-centre: a B.E.A. Viking and Pionair, and a new Convair 340 of Finnair.

International Aeradio, Ltd., have been awarded a contract by the Government of Fiji for the improvement of ground facilities at five airfields—Nasouri (Fiji Airways' main base), Lambasa, Lautoka, Tavuni and Savusavu.

* * *

Eire's Minister for Industry and Commerce, Mr. Sean Lemass, has announced his government's intention to establish an airport at Cork, the exact location of which will be announced later.

Test-bed cells for turbojets are now being constructed and engineers are being trained in preparation for the overhaul of Comet power units at B.O.A.C.'s engine and propeller factory at Treforest.

* * *

The Flying Tiger Line is reported to have sold delivery rights on two Douglas DC-6Bs to Japan Air Lines, for use on that company's projected trans-Pacific service. Flying Tiger are also said to have leased four DC-6s to Northwest Airlines for a period of seven years.

* * *

Qantas Empire Airways announce the appointment of Mr. D. C. Dunne, formerly the company's representative in Tokyo, as manager for South Africa. The appointment follows the successful establishment of the Sydney-Johannesburg "Wallaby" service across the Indian Ocean.

* * *

The Flight Safety Foundation announces the election of Admiral John T. Towers (U.S.N. ret.) as president. Mr. Jerome Lederer, who built up the organization, will remain with it as active director. In taking over his new appointment, Admiral Towers has resigned from his consulting connection with Pan American World Airways.

FROM THE CLUBS

MEMBERS of the public will be admitted (at 2s 6d) to the Vintage Aeroplane Club flying display at White Waltham tomorrow, which starts at 2.30 p.m. Secretary David Ogilvy describes it as the club's "most ambitious effort to date." At the time of going to press he was still gathering details of entries for the West London Trophy Race, the major event, but said that definite entries would include G/C. C. M. M. Grece (Nighthawk), Neville Duke (Tomtit), C. D. Street (Swallow) and Pat Fillingham (Cirrus Moth). Ogilvy will also be flying—in a Moth Major. There will also be two one-class scratch races for, respectively, Tiger Moths and Magisters, with trophies presented by the manufacturers. Aircraft to be demonstrated include the Hurricane and Fulmar and the Stampes of the Patrouille d'Etampes. "Chuck" Thompson will perform wing-walking and gymnastics from struts before making a parachute descent. After the show, which is due to end at 5.30 p.m., pleasure flying will be available in a Rapide of Wolverhampton Aviation Ltd. Gates open at 1.30 p.m., and non-competing visiting aircraft are to arrive by 1.45 p.m. Extra buses from Maidenhead will be provided for the public, who are asked to enter by the south-east entrance (by the West London Aero Club premises). Proceeds of the display will go to the Alcock and Brown Memorial Fund.

TWO members of Strathtay Aero Club, Mr. W. H. Byars and Mr. William Thom, recently won the principal award at the four-day international round-Switzerland rally, flying the latter's Hornet Moth. Some 30 aircraft from many different countries took part in the rally, which was based on Basle. Competitors made several flights to different parts of Switzerland, interspersed with competitions.

AN extra piece of paper was allegedly added to the Denham Flying Club's wall graph to accommodate the record July flying total of over 260 hours (reported previously in *Flight*). A further item from the club's latest newsletter reports "As most members are aware, ZH is a faster and—let's face it—nicer aeroplane to fly than BS. So, as there is such a greater demand for it the C.F.I. has decided to raise its price by 5s per hour . . . if you want a good seat in a cinema you pay more—to see the same film. . . ."

We do not know why D.C.G. (Wilbur) Wright, the C.F.I., changed his mind, but the "stop press" column in the same issue, stating simply "results of high-level conference: price of ZH not—repeat not—to be raised," would seemingly hide an interesting story in persuasion.

AUTOCRAT AND MAGISTER, two of the most widely used private-flying trainers, are represented in this line-up of the Elstree Flying Club's five-aircraft fleet. On the right are members of the club's staff: (left to right) Messrs. E. E. Chick (chief engineer), A. D. Pickup, G. E. Hilder (secretary), D. F. Ogilvy (C.F.I.) and A. Noyes. Last month the club flew 305 hr—the best total to date.

SOME BABY-CARRIAGE: After his recent flight in the Handley Page Victor, recorded on page 252, Mr. Harold E. Talbott remarked on the beautiful handling characteristics of the machine. It was, he said, "just as easy as a baby-carriage." He thought it would be very serviceable to either or both the R.A.F. and the U.S.A.F., and a point which particularly appealed to him was the side-by-side seating of the pilot and co-pilot. These two worthies, he thought, might play gin rummy in comfort.

SERVICE AVIATION

Exercise "Mariner"

THE NATO maritime exercise code-named "Mariner" is due to begin on September 16th and will last, in various phases, for 19 days. It will involve the use of 300 ships and 1,000 aircraft.

The whole of Coastal Command will be operating; one squadron being based in the United States and operating under the command of C-in-C. Western Atlantic while a U.S. Navy air squadron will operate from a base in Scotland. An R.C.A.F. Maritime squadron will be working from St. Eval in Cornwall.

In his capacity as Air C-in-C. Eastern Atlantic, Maritime Air C-in-C. Channel and A.O.C-in-C. Coastal Command, Air Marshal Sir Alick C. Stevens will control more than 120 maritime reconnaissance aircraft. Other air commanders from the R.A.F. will be A.V-M. R. L. Ragg (A.O.C. No. 18 Group) as Air Commander Northern Sub Area; A.V-M. T. C. Traill (A.O.C. No. 19 Group) as Air Commander Central Sub Area and A. Cdre. W. H. Hutton (A.O.C. R.A.F. Element Chatham) as Commander Nore.

The aircraft carriers *Eagle*, *Illustrious*, *Implacable*, *Indefatigable* of the Royal Navy will all take part and the Royal Canadian Navy is sending the *Magnificent*. The Americans are employing the carriers *Bennington*, *Wasp* and *Siboney*.

A.V-M. W. A. D. Brook

AT the inquest which followed the flying accident in which A.V-M. W. A. D. Brook lost his life, witnesses said that the Meteor he was flying appeared to loop and then hit the ground at an angle of 40 degrees. His instructor, F/L. L. Morley, who commands the Bomber Command Jet Conversion Flight at Coningsby, said that the air vice-marshal was absolutely competent to fly solo, that he was on an exercise flight during which he should have climbed to 40,000ft and then returned, and that it appeared that A.V-M. Brook was carrying out manœuvres which were not part of the exercise. A verdict of death by misadventure was returned.

Greenland Expedition Re-supply

SHORT Sunderlands of No. 201 Squadron, R.A.F. (S/L. R. A. N. McCready), have again carried stores from Young Sound to Britannia Lake to re-supply the British North Greenland Expedition, which now starts on its second and final year.

The lift, involving some 65 tons of stores, was completed in only four days. No snags were experienced until the last flying boat was leaving, when floating ice and a strong gusty wind combined to force the boat ashore, causing damage to the hull. Temporary repairs with home-made collision mats and cement enabled a return flight to base to be made.

Forty Years' Service

AFTER 40 years' service, W/O. S. R. Pegg, who joined the Military Wing of the R.F.C. in October, 1913, is retiring. During the First World War he served under Lord Trenchard, then a Major in the R.F.C., and Capt. Ball V.C. and saw service aboard H.M.S. *Pegasus*.

R.A.F. Lincolns for Malaya

TO supplement the Royal Australian Air Force Lincoln squadron, which has been operating in Malaya from the beginning, almost, of the emergency, a squadron of R.A.F. Lincolns left Hemswell for Singapore last week. On arrival they will operate from R.A.F. Station Tengah.

Some of the ground crew are travelling in the Lincolns and the remainder will make the journey in three Yorks.

An early task for two of the Lincolns will be to carry freight to the Cocos Islands, one of the staging posts in the forthcoming England-New Zealand air race.

"MOMENTUM" WINDS UP

THE second phase of exercise "Momentum" took place between 1000 hr on August 19th and 0500 hr on August 20th. It differed from the first phase only in that the two Naval convoys were not there to be protected by Fighter Command and that Fleet Air Arm aircraft were not engaged. These were, however, once more to play a part in the final phase over the week-end August 22nd to 23rd. The Royal Observer Corps could not join Phase 2 until 1900 hr on August 19th.

Operations began on the morning of the 19th with reports of P.R. Canberras from the Continent flying over Scotland, the Midlands and Southern England; synchronized raids were made by small formations of Canberras on Southampton, Birmingham, Liverpool, Middlesbrough, Glasgow and Edinburgh. Fourteen interceptions by Meteors were claimed on these raids at heights up to 43,000ft, although the Canberras were said to be operating unrestricted. A B-45 was also intercepted by Meteors at 40,000ft while heading for the industrial area of Scotland. Venoms intercepted a formation of Canberras at 40,000ft over the north-east coast, and Meteors caught two B-36s heading eastwards over the Channel.

During this high-level activity F-84s from 2nd and 4th A.T.A.F. also carried out dive-bombing attacks against airfields and other targets; R.A.F. Odiham was among the stations to receive such attention. After dark the night fighters took over, and a description of operations at West Malling during the night appears on page 268.

The final phase of the exercise opened last Friday night at 2100 hr and continued until 1800 hr on Sunday evening. Between 2300 hr and midnight Washingtons raided Harwich, Chatham, Dover and Folkestone, while Lincolns and Varsities had Southampton and Liverpool as their targets. Early on Saturday morning Aberdeen, Newcastle, Hull and Carlisle were targets for Lincolns, and towards 0400 hr Canberras in small formations simultaneously attacked Dundee, Edinburgh, Hull, Sheffield, Tilbury and Portsmouth. Shackletons of Coastal Command made low-level mine-laying sorties in the Firth of Forth and the Humber, and Meteors from bases in Scotland and N.E. England made interceptions. Fireflies and Sea Furies of the Fleet Air Arm attempted strikes on convoys off the East and South coasts, and were likewise engaged by Meteors.

After first light, "enemy" activity increased considerably and attacks were of five main types: (1) high-level raids by jet fighters simulating jet bombers; (2) jet fighter/bombers dive-bombing airfields and other military targets; (3) jet fighters and fighter/bombers making low-flying attacks against airfields; (4) Canberras, B-50s and B-45s attacking ports, airfields and industrial targets from high level; (5) attacks by the Fleet Air Arm on convoys in the Channel and off the East coast.

Specifically, F-86s and Venoms from the Continent simulated high-level attacks on (among other centres) Liverpool, Hull, Birmingham and Bristol. F-84s dive-bombed Horsham St. Faith, Thornaby, Linton, Waterbeach, Wymeswold, Bentwaters, Lakenheath and Church Fenton; and West Malling, Bentwaters and Tangmere experienced low-level attacks by other F-84s. Canberras and B-50s operated against Aberdeen, Newcastle, Edinburgh, Cardiff, Dundee, Hull, Southampton, Harwich, Avonmouth, the Humber, the Tees and the Firth of Forth. Sea Furies and Fireflies were in action against the two

convoys but a report that a Gannet was among the raiders was later modified to read "Avenger." R.Aux.A.F. squadrons had a successful day at high and low level. For the period 0930 to 1230 hr Fighter Command scored 171 interceptions out of 330 sorties. H.Q. A.A. Command reported several aircraft shot down by light anti-aircraft regiments deployed to defend fighter airfields in East Anglia and southern England.

During Saturday night large and medium-sized bomber raids were mounted against industrial targets. Some 50 Lincolns were directed against London and some 25 Canberras against Derby; simultaneously a smaller force of Washingtons attacked Edinburgh and Glasgow. Flying Training Command had London, Birmingham, Middlesbrough and Edinburgh as targets, and B-26s from the Continent intruded against airfields. A "large number" of interceptions were reported. Next morning attacks followed the usual pattern—Canberras at high level, B-45s and jet fighters simulating bombers, and dive-bombing and low-level attacks by F-84s. Fleet Air Arm strikes against the Channel convoys were intercepted. Worsening weather after mid-day to some extent restricted activities of all concerned.

In his summing up of the exercise at a conference in London last Sunday evening, Air Marshal Sir Dermot Boyle, A.O.C-in-C. Fighter Command, said that of 10,000 sorties flown 7,600 had been made by the defending forces. "I feel," he said, that as we have not got Swifts, Hunters and Javelins my primary responsibility is to make sure that if we had them tomorrow we could use them in the most efficient way possible. From what I have seen of the exercise I think we will go as near using them efficiently as it is humanly possible to go." He went on to explain: "We would have done infinitely better had we had higher-performance aircraft. Many of our interceptions just missed because of lack of performance." He emphasized that the percentage of successful interceptions at night had been higher than in the day.

Air Marshal G. H. Mills, A.O.C-in-C. Bomber Command, remarked that almost one-third of the aircraft in the attacking sorties had refuelled in Germany, Denmark and Norway. "We had only one night when we had no operations at all," he said, "and at the end of the exercise we had at least the same number of aircraft and crew serviceable as when we started."

Moment in "Momentum": The port scanner of a Washington at 20,000ft keeping a lookout for fighters.

FLYING WITH THE WASHINGTONS

THE third — and final — stage of "Momentum" was concluded on Saturday night, so far as R.A.F. Marham was concerned, by a raid on Waverley Station, Edinburgh. Marham has the only units still equipped with Washingtons and as these are gradually being ferried back to the United States, this was possibly the last use of B-29s in an R.A.F. exercise.

The four squadrons based at Marham put up a total of twelve aircraft, each one simulating three, so that a Washington had to undergo three separate attacks by intercepting fighters before it could be claimed as a "kill." Interceptions were signalled by a system of flashing lights, from a gunner's position in the case of the bombers and by the fighters' navigation lights. The first one to flash on sighting an "enemy," claimed the kill. When a bomber had been intercepted three times, it returned direct to base.

Briefing was at "1415 Zebra" (since Zebra time is Greenwich Mean Time, 1415 Zebra equals 1515 B.S.T.). All was on a wartime footing and the well-worn phrase "press on" was to apply for the whole sortie, irrespective of instrument or engine failure, except in extreme cases. Met. informed us that weather was varied, with some cu-nim over the Continent, and a chance of thunderstorms; but visibility promised to be good over base by the time we returned, so there was no likelihood of re-routeing, as had happened earlier in the exercise. Intelligence reported considerable fighter activity to be likely all along the route. Take-off was timed for 1627 Zebra for the first aircraft, with one minute intervals for each successive one, and E.T.A. over the target area was 2130 Zebra, altitude 23,000ft.

After briefing we kitted-up and crew transport took us to WW 352, which was being checked by the ground crew. Soon, all was ready and we taxied out on the runway. Precisely at 1629 Zebra we started rolling, then took off, and began a climb to 15,000ft on a S.E. course.

The coast was crossed at Beachy Head and, once over the Channel, fighters were sighted. We were attacked by a pair, one of which was claimed by a gunner. Interceptions ceased over France and a turn to port brought us on to the second leg, with cu-nim proving the Met. officer's forecast to be correct. This leg finished at Rheims, where we started climbing on a N.E. course for the rendezvous-point over the North Sea. Hot tomato soup was welcome as we reached this point and the fourth leg was started, at 23,000ft, with a line-up for the target as the last light of day disappeared.

Edinburgh saw us only two seconds off the E.T.A. and the simulated radar attack was "bang on" the target, much to the delight of the whole crew, who duly celebrated the fact with coffee. Incidentally, the Washington is generally much liked by all the aircrews, the typical American emphasis on comfort no doubt contributing in no small measure. As the fuselage is fully pressurized, oxygen masks are not required and this feature is as popular as the electric urn in which tinned soup, etc., can be heated.

The West coast of Scotland was now behind us and, once again over water, we made a port turn to bring the Isle of Man on our starboard side. Let-down started as the English coast was recrossed and, heading across the country, we arrived at the dispersal point, off the Wash, at the arranged 7,000ft. Touch-down was made at 2340 Zebra (0040 hr local time), with 7¼ flying hours behind us and 1,700 miles covered.

De-briefing showed that the station's sorties had been a complete success, though a considerable number of interceptions had been encountered.

R.O.C. PARTICIPATION

SEVERAL units of the elaborate ground organization now contributing towards Britain's defences were engaged in the exercise. One of these was the Royal Observer Corps, a large part of which was alerted. Thirty-four groups, including some 1,200 posts, covering the greater part of the country, were mobilized, and about 10,000 members took part. As "Momentum" came in the middle of the holiday season, the shortage of trained personnel meant that many observers able to do so attended all duties—a total of 49 hours.

A *Flight* contributor who is an R.O.C. observer in an operations centre writes: "As in earlier exercises, much attention was given to the rapid reporting and plotting of fast, low-flying raiders—one of the more elusive types of 'hostile' with which the Corps has to cope. Techniques developed last year and practised throughout the winter were given a thorough try-out. With a large percentage of the personnel comprising recruits lacking in operational experience, it was gratifying to see how quickly they got into the swing of things and how confidence and morale mounted when it was realized that *they* were actually coping with the varied demands thrust at them. Many elements of surprise were introduced so that constant vigilance was imperative. But, whether it was long stretches of boredom, moments of exciting activity and near panic, 'Momentum' was, for many observers, over all too soon."

THE NAVAL ASPECT

THE Royal Navy's share in "Momentum" was the provision of convoys and the aircraft to strike at them. These elements were supplied at the request of the Royal Air Force, who even decided the directions and heights from which the attacks were to be made. The Navy's interest was, therefore, very detached.

Two convoys were provided, each about 10 ships strong; one proceeded at eight knots along the East Coast and the other at six knots along the South Coast. With the eastern convoy was the radar trials ship *Fleetwood*, while the Dutch direction ship *Soemba* was with the southern convoy.

For each of the four days comprising the first and third phases of the exercise, five attacks were planned against each convoy. There was no Naval participation in the second phase.

Operations were centred at R.N. Air Station Ford, Sussex, where Nos. 800 and 803 Squadron (Attackers) and No. 813 Squadron (Wyverns) are based. The station, known also as H.M.S. *Peregrine*, is commanded by Capt. J. C. Cockburn, D.S.C., who is himself one of No. 800 Squadron's wartime fighter pilots. In the operations room—in splendid isolation—Lt.Cdr. G. P. L. Bolt (Lt.Cdr. Ops) kept

EXERCISE "MOMENTUM" . . .

vigil to co-ordinate the programme of attacks.

It would be tedious to record the details of all the raids flown and the following are selected as typical of those which took place last Saturday. The ball opened with Wyverns attacking the southern convoy at 0630 hr. They had previously flown to Cherbourg, where they turned and flew in at "nought feet." As the convoy was approached fighters were seen overhead and the Wyverns sheared off for a while. Coming in later, they were able to attack without being seen—in fact, the R.A.F. enquired as to whether or not the raid had been cancelled.

At 0800 hr four Sea Furies of No. 1832 R.N.V.R. Squadron, Benson, after travelling outward and turning above Antwerp, were intercepted at 13,000ft, 40 miles to seaward of the eastern convoy off Orfordness.

Another attack on the eastern convoy came at 0930 hr, when eight more Sea Furies from Benson came in from the direction of Texel and were intercepted at 12,000ft, two miles north of the convoy.

At the same time, 0930 hr, Fireflies from Lee-on-Solent, coming in from the direction of Amiens, attacked the southern convoy, from between 600 and 800ft, 15 miles south-east of Brighton. These Fireflies were intercepted after raiding.

The next raid on the southern convoy, at 1330 hr, was by four Attackers from Ford. They had been out to Compiègne before turning for the convoy, which was found a few miles S.E. of Beachy Head. Two defending Meteors put in an appearance immediately after the attack had been completed.

Another R.N.V.R. squadron, No. 1833, from Bramcote, Nuneaton, made the 1330 hr attack on the eastern convoy with eight Seafires. These went out to Texel and back with the intention of attacking the convoy off Happisburgh. Their landfall, however, was some six miles south of the convoy and because of low cloud and shortage of fuel a square search for the convoy was not instituted.

To complete the day's work four Fireflies left Lee-on-Solent and four Attackers left Ford to attack the southern convoy. The departure of the Attackers was a little unreal because they were jumped by two Meteors—probably from Tangmere—before they were out of sight of the airfield.

Fireflies and Sea Furies, all from R.N.V.R. squadrons at Stretton, Warrington, attacked the eastern convoy at 1730 hr and 1930 hr respectively.

On the final day of the exercise bad weather interfered with the programme and only the six morning raids—three each against the two convoys—were flown.

NIGHT FIGHTERS AT WEST MALLING

DURING Phase II of exercise "Momentum," on the night of August 19th to 20th, the West Malling night fighter squadrons were fully operational and being kept busy with all types of night raids. Both Vampire N.F.10s and Meteor N.F.11s are based there and both types are well liked by their crews.

As was the case on every station participating in "Momentum," West Malling was on an operational footing, with guards posted, aircraft dispersed and lights dimmed; and, as darkness approached, final preparations were made for a long night's operations. At 1930 hr crews received their briefing; the weather was none too hopeful, a front being expected to "clamp" the airfield by the early hours of the morning; neither was there any indication of the type or strength of the threat which would have to be met. By 2030 hr all crews were at ten minutes' notice to scramble and the ground-control organizations ready.

Trouble came almost immediately and two fighters scrambled as the sun sank below the horizon. The distinctive navigation light patterns of Vampires and Meteors could thereafter be seen moving up to the take-off point and then racing down the runway and climbing away to the clouds.

In the control tower, under dim lights, the airfield and C.R.D.F. controllers were at their desks, listening to several voices at once, and quickly giving the required reply to each; little could be seen but much heard, and the airfield was covered with varicoloured lighting systems. But the controllers knew each pilot and his individual characteristics; those in the air and on the ground understood each others' requirements. This understanding was also developed to a high degree between aircrews and their G.C.I. controllers, for night fighting is essentially an individualist occupation, and each crew has its particular preferences in manœuvre and attack. Night interceptions are always made by single aircraft, guided initially by G.C.I. and then relying on their own A.I., and finally on visual identification, for their attack. Pilots carry out most of their flying on instruments and operate alone, as opposed to the day fighter, who must have a wing man to provide tail cover. Night fighting therefore requires a pilot with considerable experience and hence often of more advanced age, and it was interesting to hear at West Malling that pilots with transport and instructional experience were excellently suited for night fighting. The average age of the pilots was in the late twenties.

A vital stage in an interception is the visual identification of the target. Once the "bogey" is identified as a "bandit" the attack must be made and, because of the nature of the game, the essential element of surprise is thereupon lost; the "bandit" will take evasive action, and, if of Canberra type, disappear rapidly into the night. The moves for stalking and identifying the "bogey," however, resemble those of those traditional games of deceptive simplicity and immense cunning, of which ju-jitsu is probably the highest stage of development. At West Malling we found a thorough understanding of the human and mechanical or electronic subtleties involved in night fighting, but most interesting discussions were unfortunately curtailed by the requirements of security, of which everyone was commendably conscious. The night fighters are experts and enthusiasts, eternally in search of the best in equipment, and constantly developing and refining their techniques.

During the night, some time was spent at the Meteor and Vampire dispersals; one Vampire crew, just returned from a sortie, reported an attack on a Canberra flying at 40,000ft at an impressively high Mach number. A Meteor N.F.11 also coped comfortably with a B-26 which made a low-level attack on the airfield. As the night wore on, however, the expected front came slowly in, ahead of time, and pilots reported heavy icing; intakes and nose-caps of the formidable N.F.11s showed the familiar scars of rain and hail. The cloud-ceiling fell lower and lower and a fine drizzle began; but, as we left the friendly atmosphere of the station, fighters were still going up to intercept and pilots expected an arduous night's work.

The men who operate by night: These photographs of West Malling night fighters taken during exercise "Momentum" show (left) a Vampire N.F.10 crew leaving their aircraft after a sortie, with the ground crew already at work, torch in hand, refuelling and rearming; and (right) a massive bowser dealing with the thirst of a Meteor N.F.11. "Flight" photograph

SERVICE...

on the spot

At London Airport, Goodyear maintain a staff of resident engineers with full facilities for on-the-spot repairs and routine servicing. A direct transport link maintains regular contact between users and the factory at Wallasey.

at Wolverhampton

Requests for emergency help are dealt with by the staff of technical representatives at Wolverhampton. Here, also, the design of tyres, wheels and brakes to give maximum service for minimum weight is discussed with aircraft manufacturers.

and at Wallasey

The modern factory at Wallasey is devoted entirely to the design, construction, testing and repair of aircraft wheels and brakes.

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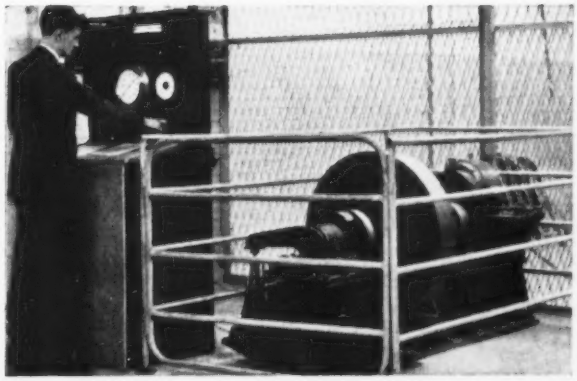

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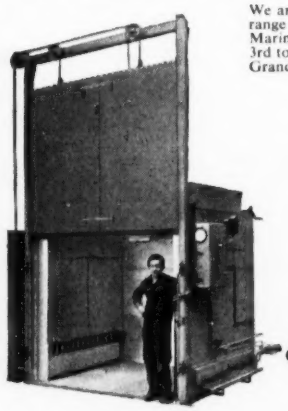

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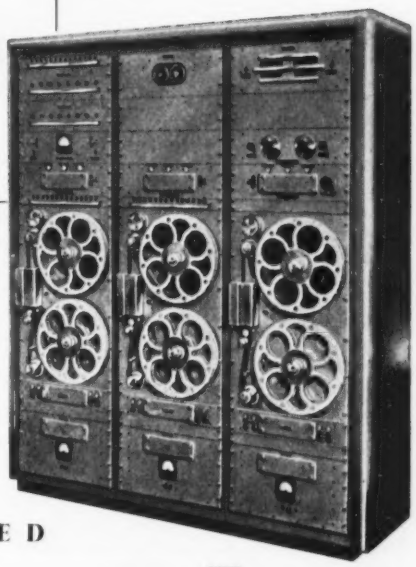

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Torque (at 50 p.s.i.) ... under 15 lb/in
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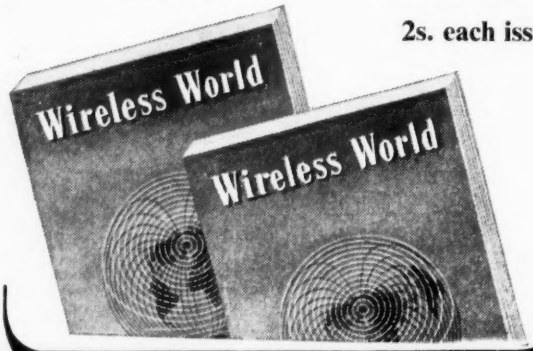

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Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

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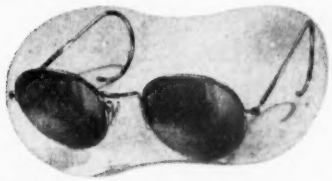
The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Situations Vacant. The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc. if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.



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TO B.S. SPECIFICATION S.P.47

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PRESS NOTICE

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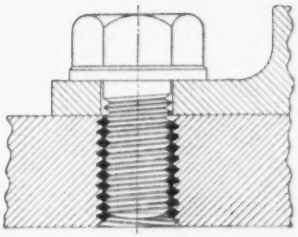

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IMMEDIATELY. Light plane, perfect condition, fully equipped; single or twin engined. Recent Auster or Gemini or similar.—Fullest details to R. J. Gates, c/o Ballagawne, Kirk Michael, Isle of Man. [9974
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R. W. SUTTON (CONSULTANTS), Ltd., 7 Lansdowne Place, Cheltenham. Tel. 5811. [0750
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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned application to operate a scheduled air service:—

Application No. 210 from British Overseas Airways Corporation, of Airways House, Great West Road, Brentford, Middlesex, for traffic stops for the maximum period at Mafraq (Amman) and Baghdad as alternative to Beirut or Damascus and for the terminal point to be at either Kuwait or Bahrein at the discretion of the Corporation on their normal scheduled service on Route 2 (London-Bahrein) in Schedule A, Part I of the terms of reference issued to the Air Transport Advisory Council by the Minister of Civil Aviation on July 30, 1952.

THIS application will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to this application must be made in writing stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [9978

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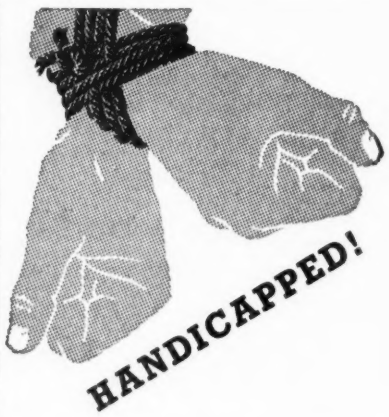

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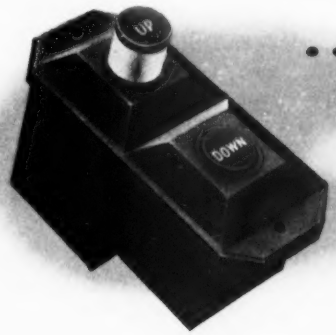
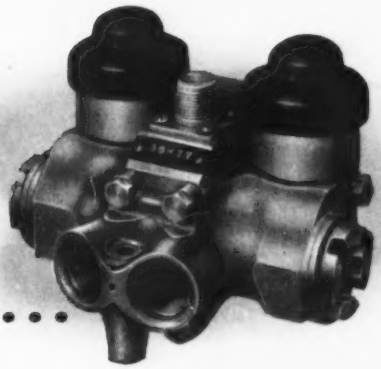
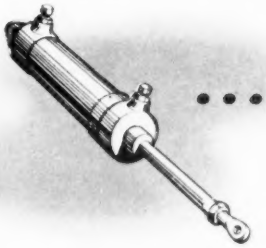


. . . this is the SWITCH

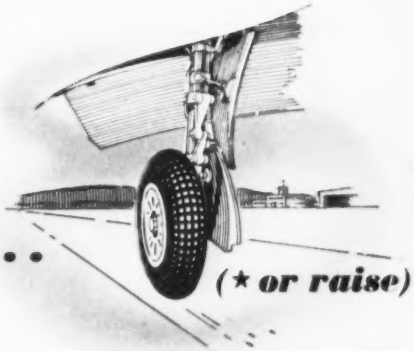


that controls the VALVE . . .

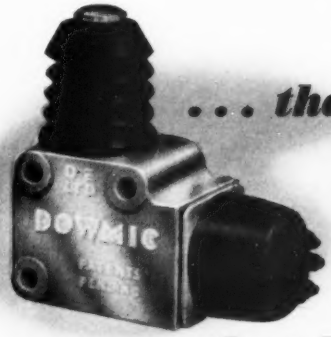


. . . that tells the JACK

to lower ★ the LEGS . . .

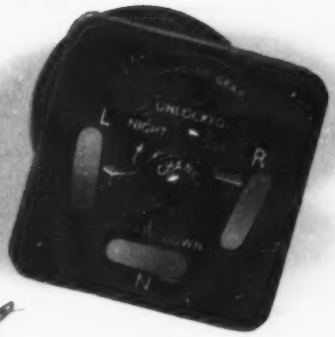


(★ or raise)



. . . that press the SWITCHES

that light the LIGHTS . . .



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